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THE
LITTLE RED DEER
RIVER

toward
a
land
use
and
resource
management
plan . . .

THE RED DEER REGIONAL PLANNING COMMISSION

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THE LITTLE RED DEER RIVER

PILOT STUDY

PREPARED BY:

RED DEER REGIONAL PLANNING COMMISSION

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RED DEER, ALBERTA
T4N 5Y5

FILE No.

May 2, 1978

Mr. J. O. Wagers
Chairman
Red Deer Regional Planning Commission
Box 5002
Red Deer, Alberta

Dear Sir:

Re: Little Red Deer River Pilot Study

The Little Red Deer River Pilot Study is one of five pilot studies of rivers and their shorelands undertaken throughout Alberta by regional planning commissions under the sponsorship and subsidization of Alberta Environment. The concern for rivers and their shorelands which motivated this undertaking was initially expressed by the Task Force on Shorelands, structured under the Conservation and Utilization Committee in the Provincial Government. Members and staff in this Commission promptly identified with this concern and agreed to undertake a pilot study to advance the overall stock of knowledge relating to rivers.

The present study has a dual thrust according to terms of reference set forward when it was initiated. First of all the intention has been to design a methodological planning procedure which can be applied to the Little Red Deer, and thereafter extended systematically to planning studies of other rivers. Secondly, the intention has been to prepare a shoreland management strategy dealing with the Little Red Deer River. This strategy is intended to assist the counties of Red Deer and Mountain View as well as the Calgary Regional Planning Commission, I.D. No. 8 and the Provincial Government in guiding the future use of lands along the Little Red Deer River and the waters within its channel.

We submit this document with confidence that both purposes have been addressed and that planning for river shorelands in the Province of Alberta is advanced herewith.

Yours truly,

R. R. Cundy, M.C.I.P.
Director

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Acknowledgements

Bringing the Little Red Deer River Study to publication was made possible only through the cooperation and encouragement of many people. Those mentioned below were particularly instrumental in its completion, others were most certainly involved.

Alberta Environment graciously allotted additional time and funds for the Study while Ken Smith and Anke Seifried provided the encouragement and flattery that kept the work alive. For you, I trust your confidence will not prove unjustified. All members of the Task Force on Shorelands were helpful in making information available. David Luff and Richard Shelford of Ptarmigan Aerial Surveys generously did the photo interpretation for Maps 9, 10 and 11 without charge. To you, a special expression of gratitude.

My Section Head, Bill Shaw, while allowing the Study to go considerably over the scheduled time frame, has been most gracious in expressing his confidence that the product would be worthy of the frustrations. My sincerest apologies if they are not. The rest of the staff and the Commission Director, Robert Cundy supplied motivation, altered their own schedules to accommodate the extension of this work, and added to the overall positive working atmosphere. Holger Rasmussen, Paul Fenwick and Al Ward reviewed the first draft and offered helpful suggestions which have been used. Both, Brian Grosseth and Gert Willems, were patient, accomplished and forgiving while preparing tedious matrices and figures. The typists seemed always prepared to take another chapter, type and return it both quickly and with clarity. Thank you Colette, Trudy, Myrna, Lou, and Judy. Special appreciation is expressed to Gloria Vollmin, who typed the final draft complete with double columns and figures. Garth Clyburn and Barbara McCord were instrumental in really getting the data together and making most of the contacts in the field and among the supply agencies, and Garth provided numerous insights on planning directions as well as writing the first draft of several sections of the report.

Appreciation is also expressed for the Community Associations who sponsored public meetings, and to the land owners along the Little Red who returned questionaires, phoned, or wrote to express their views.

The Counties of Red Deer and Mountain View facilitated the Study by supplying ownership information and freedom to pursue the Study within their administrative jurisdiction. Also, the Calgary Regional Planning Commission encouraged this Commission to extend the Study into the headwaters areas which is in I. D. No. 8.

S. Richard White

April 1978

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1 PREFACE

PREFACE

A PLAN FOR THE LITTLE RED DEER

This study began in response to an initiative by the Provincial Department of the Environment to develop a methodology that could be applied to integrated planning programs along rivers and their shorelands. In pursuing that initiative, the Red Deer Regional Planning Commission selected the Little Red Deer River as a pilot project for river shoreland planning. This initiative in river shoreland planning has arisen from a growing need to protect and maintain important natural resources which inherently attract development pressures, and an increasing awareness that discreet management planning is essential to the wise use of these resources by present and future generations.

While the Little Red Deer valley supports an expanding agricultural industry and maintains a major oil and natural gas industry, it is increasingly in demand to meet the recreational needs of an area that extends from Red Deer to Calgary. These needs take the form of camping, cottageing, fishing, snowmobiling, picnicking and institutional or organized camp facilities. Also, if there are any unique or irreplaceable natural resources within this corridor, they should be preserved. Furthermore, management guidelines should be implemented to maintain the integrity of the entire riverscape.

While recreational pressures are mounting and many of them should be accommodated, no acceptable plan will jeopardize the traditional and intrinsically viable economy or community structure that currently exists along the Little Red Deer River. In preparing a plan therefore, every possible effort needs to be made to enhance opportunities for economic stability and growth in the agricultural sector, rural industrial enterprise and the rural lifestyles generally that are cherished by residents along this river.

PURPOSE OF THE STUDY

The purpose of the Little Red Deer River study is to locate critical areas along the river that should be protected by special conservation measures as well as identifying those portions of the river and its shorelands which are best suited to restricted and passive forms of use, areas for moderately active or extensive uses and areas which are suited to very active, intensive or exploitative forms of use and development. Management recommendations are presented to regulate land use and development along the Little Red Deer according to patterns that are in harmony with these identified areas.

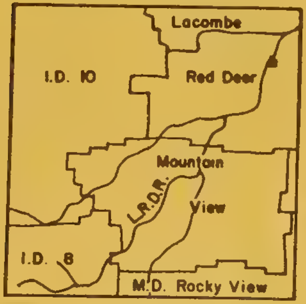
Secondly, a purpose of this study is to develop and apply a planning process particularly equipped for river shoreland evaluations. That process is presented here so that the methods used will be available to all. The concepts and recommendations presented are expected to provide a strong functional basis for future planning of other river shorelands.

2 SUMMARY

SUMMARY

The Little Red Deer River Pilot Study began in response to initiatives by Alberta Environment's Task Force on Shorelands to develop an integrated planning methodology for river shorelands. That initiative surfaced from a growing awareness of the need to identify and protect critical natural resources which inherently attract development pressures. This Study was designed to develop guidelines for management of the shorelands along the Little Red and to develop a planning process that can be applied to this and other river shoreland studies.

GEOGRAPHIC BACKGROUND



The Little Red Deer River is located to the south and west of the City of Red Deer and drains a watershed covering 2350 square kilometers. It flows out of the foothills in I.D. No.8, and then in a north-easterly direction across the Counties of Mountain View and Red Deer eventually emptying into the Red Deer River about 15 kilometers west of Innisfail.

Prior to 1890 very little of the basin was cleared, but since that time extensive areas have been cleared and put into agricultural production, particularly that portion occupying the western Alberta plains. Much of the foothills area remains forested and access there is quite restricted. The steeper valley sides and confined valley floor areas are still covered with native trees. Throughout the farmland portion, soils are generally thick black chernozems except in the valley areas where regosols prevail. Farm practices along the river range from extensive grazing and forage production, through cereal crop growing to feedlot operations. Other forms of activity that occur along the shorelands are oil and gas production, gravel mining, public recreation, church camps and residential subdivision.

Hydrologic conditions in the river are below optimal but little attention is given to their management. Extreme deviations from the mean flow occur and for any given year, water levels fluctuate quite notably. In recent years summer and fall flows have dropped to near record lows with resulting deterioration of water quality, recreational appeal and fishing success. Flooding and erosion are of very minor concern along the Little Red. Fish are not plentiful and those species of sport fish known to dwell here are declining in numbers. The foothills tributaries provide somewhat better angling success. Wildlife take advantage of the valley characteristics. Forage and browse is available midst the sheltering canopy of trees and water is available for drinking. The wildlife populations consist of ungulates, furbearers, upland birds and waterfowl. Beaver and mule deer are probably the most commonly evident species.

Recreational canoeing is not considered feasible along most reaches of the river because there is insufficient water. Only very seasonal paddling or carefully selected deep water runs offer any appeal to the canoeist.

METHODOLOGY

The Approach:

The approach developed for this Study is organized around five simple but key propositions. Each proposition serves as an objective in the development of the technique.

1. Rivers are water systems composed of a regular and predictable set of features. (Figure 1)

Any study of a river should include the total area within which continuous river processes and drainage regimes operate. That is, it should include all land within the functional boundaries of the river channel, streamway, floodplain, valley, upland, and watershed. Within this riverscape are found the full range of natural, cultural and esthetic characteristics which contribute to the benefits available from the river.

2. River channels can be divided into a hierarchy of segments.

Considering the river as a whole, it can be broken down into parts which may be called "segments of experience". At each scale minimum meaningful size segments can be identified. From the largest units to the smallest progressively, this Study identifies regions, subregions, channel patterns, reaches, runs and units as the areas within which data are reviewed. The unit is used as the essential segment of river experience.

3. Each river segment provides an array of characteristics which can be identified and rated according to their degree of expression. Degree of expression is a statement of the quantitative or qualitative magnitude demonstrated by a characteristic.

The level of experience (or use) possible in a unit depends on how strongly the unit expresses itself. So the magnitude of expression for each characteristic must be determined. Once these characteristics are recorded, this record provides a summary of the basic supply of riverscape resources. Units possessing high accumulations are of higher priority than those with a lesser abundance.

4. Each unit's characteristics can be grouped into categories of expression and totalled to arrive at a summary of landscape expression.

Along with the magnitude values recorded for each characteristic, its significance with respect to management requirements can be identified. Each characteristic of a unit has a bearing on the overall extent to which a unit expresses itself. But since a unit may express itself in only a portion of several possible ways, each characteristic must be considered to present a positive or a negative influence or it may have no bearing at all on a particular form of expression. All characteristics that do have a bearing on a particular form of expression can be totalled. The forms of expression used in this report are: uniqueness, diversity, fragility, seclusion, seasonality, sensuality, paddleability, cultivability, site developability, and existing development. These ten forms of expression cover the total range of shoreland management influences. All values and totals are presented in matrix format so comparisons and evaluations between values can be readily carried out. (Figures 8 and 9)

5. Knowing the nature and extent to which a landscape expresses itself, it is possible to determine the suitability of each unit for various types of landscape experience (use).

The Evaluation:

Having identified the inherent qualities of the river and its shorelands, uses must be assigned in a manner which achieves the best fit between the resource and its use. The priorities pursued in making these assignments focus on the desireability of protecting the integrity of the river resources, while encouraging the "highest quality of experience at each site". Having identified the river's inherent qualities, its important and irreplaceable assets, the next step is to consider uses which are unique to the river and are not duplicatable outside its influence. Thereafter, consideration is given to uses which are dependent on the resource base generally and are mutually compatible with each other and the integrity of the landscape. Generalized evaluations are made by determining the relationship between each form of expression so that totals that group values under general types of experience can be derived. Examples of these types of experience are: preservation, passive recreation, active recreation, agriculture, extensive economic use, and intensive use.

Public Involvement:

From the earliest preparations for the Study, through to its completion, an effort was made to keep the public informed and encourage their input. Perhaps more involvement of shoreland residents would have been desireable, but always, expenses, time and coordinating logistics have to be considered against the benefits. In recognition of the "pilot" nature of this Study, it is considered most desireable to involve interested residents and outsiders as much as project constraints will permit. Project terms of reference should in fact be designed to accommodate this type of input.

ALTERNATIVES

This Study was pursued on the assumption that there is no single right management strategy for an area so extensive as an entire river valley. Any one scheme has specific advantages, but the beneficiary is determined by the management bias. If a firm bias or predefined basic policy is in place, the options available are much narrower. Since this Study is not intended to favour particular segments of the economy, it seemed desireable to develop several alternatives for managing the area. Although four are prepared, there is nothing particularly perfect about them nor are they independent of each other. The four alternatives included in the report are:

Conservation: This alternative would conserve the river shorelands so that natural conditions are minimally disrupted. It is also known as a scenic river alternative.

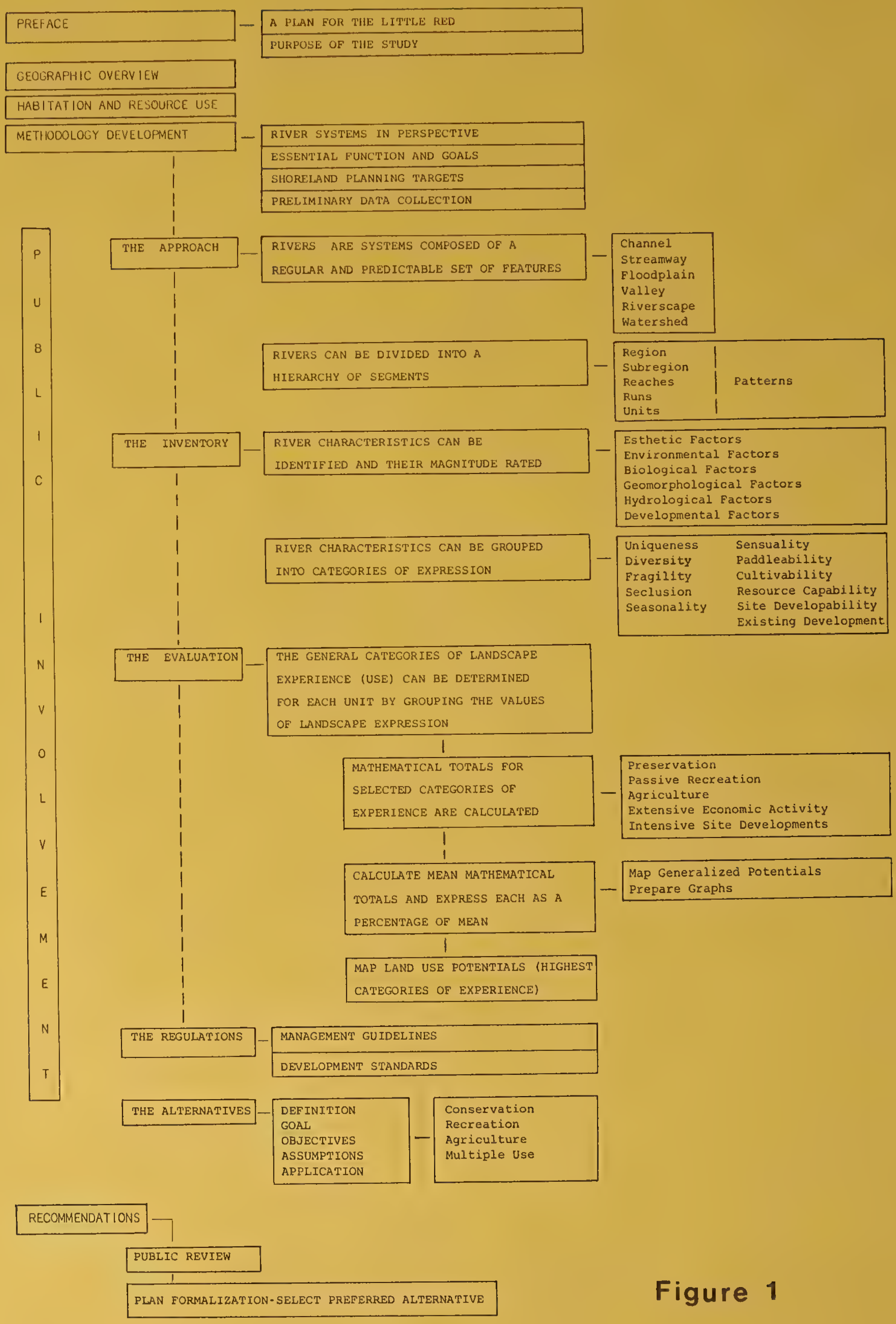
Recreation: This alternative is based on the assumption that the primary characteristics of rivers and their shorelands enhance recreational use opportunities. These opportunities are less abundant and of lower quality at non-shoreland locations. It is also referred to as the shoreland enhancement alternative.

Agriculture: This alternative is based on the assumption that food producing opportunities should be stimulated and facilitated to the greatest extent feasible, while protecting vital shoreland resources.

Multiple Use: Without assigning preference to any individual use, this alternative encourages the pursuit and development of a combination of shoreland potentials. Only the need to maintain the natural functioning of the river systems takes a predominant position.

None of the management alternatives is a single use plan. Even the conservation alternative provides for a range of developed facilities and exploitative uses. Each alternative has strong preservation requirements included. However, in each instance there is a clear statement of the need to preserve streamway and shoreland geo-ecologic and hydraulic functioning.

ACTIVITY SEQUENCE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A PLAN FOR THE LITTLE RED
PURPOSE OF THE STUDY
GEOGRAPHIC OVERVIEW
HABITATION AND RESOURCE USE
METHODOLOGY DEVELOPMENT
RIVER SYSTEMS IN PERSPECTIVE
ESSENTIAL FUNCTION AND GOALS
SHORELAND PLANNING TARGETS
PRELIMINARY DATA COLLECTION
PUBLIC INVOLVEMENT
THE APPROACH
RIVERS ARE SYSTEMS COMPOSED OF A REGULAR AND PREDICTABLE SET OF FEATURES
Channel
Streamway
Floodplain
Valley
Riverscape
Watershed
RIVERS CAN BE DIVIDED INTO A HIERARCHY OF SEGMENTS
Region
Subregion
Reaches
Runs
Units
Patterns
THE INVENTORY
RIVER CHARACTERISTICS CAN BE IDENTIFIED AND THEIR MAGNITUDE RATED
Esthetic Factors
Environmental Factors
Biological Factors
Geomorphological Factors
Hydrological Factors
Developmental Factors
RIVER CHARACTERISTICS CAN BE GROUPED INTO CATEGORIES OF EXPRESSION
Uniqueness
Diversity
Fragility
Seclusion
Seasonality
Sensuality
Paddleability
Cultivability
Resource Capability
Site Developability
Existing Development
THE EVALUATION
THE GENERAL CATEGORIES OF LANDSCAPE EXPERIENCE (USE) CAN BE DETERMINED FOR EACH UNIT BY GROUPING THE VALUES OF LANDSCAPE EXPRESSION
MATHEMATICAL TOTALS FOR SELECTED CATEGORIES OF EXPERIENCE ARE CALCULATED
Preservation
Passive Recreation
Agriculture
Extensive Economic Activity
Intensive Site Developments
CALCULATE MEAN MATHEMATICAL TOTALS AND EXPRESS EACH AS A PERCENTAGE OF MEAN
Map Generalized Potentials
Prepare Graphs
MAP LAND USE POTENTIALS (HIGHEST CATEGORIES OF EXPERIENCE)
THE REGULATIONS
MANAGEMENT GUIDELINES
DEVELOPMENT STANDARDS
THE ALTERNATIVES
DEFINITION
GOAL
OBJECTIVES
ASSUMPTIONS
APPLICATION
Conservation
Recreation
Agriculture
Multiple Use
RECOMMENDATIONS
PUBLIC REVIEW
PLAN FORMALIZATION-SELECT PREFERRED ALTERNATIVE

Figure 1

3 RECOMMENDATIONS

RECOMMENDATIONS

A. PLANNING METHODOLOGY

1. Vital natural resources must be identified, protected, and their use discretely planned.

2. Planning for the future management of the river shorelands should not jeopardize the intrinsically viable economy and community structure that has become established there.

3. It is recommended that a basic and standard planning approach, suitable for application to most Alberta rivers be developed and made available to local agencies. Such an approach should have flexibility so it may be adapted to individual regions or stream types.

4. Studies of river shorelands should preferably include a familiarization with and analysis of the entire watershed drained by the stream, but as a minimum must focus on the riverscape. (See glossary)

5. Inventory and analysis of data on river shorelands should be based on two general landscape areas. The primary area is the Streamway Corridor, and the secondary area is the Streamway Influence Belt.

6. Planning and management of river shorelands must be based on the premise that the river forms a continuous linkage corridor and no unit along it can be independently considered. This is particularly true concerning upstream locations since they supply water to downstream areas.

7. In planning river shoreland use it is desireable to consider each side of the river as a separate landscape unit except where linkages across the river are strongly expressed.

8. A contact and responsive stance should be maintained by planners and management authorities with local residents and groups who propose positive management directions for river shorelands.

9. The land-use plan adopted for a river should be ecologically based but must also reflect the social and economic realities of the area and time. The plan must consider those natural processes which shape the watershed and sustain its life and be in harmony with the land's carrying capacity, protective of its naturally productive ecosystem and scenic resources and not present a hazard to health, investment or life.

10. Pursuant to carrying out planning studies for river shorelands, an implimentation program and schedule should be adopted.

B. FLOW CONTROL AND WATER SUPPLY

1. Flow levels on the Little Red Deer River should not be regulated by structural means. The annual flushing out of the river is beneficial in view of the effluent loadings presently added. Although flow stabilization would probably provide some advantages for recreational functions, the costs, losses of productive land, and disruptions caused by damming the river would greatly exceed the benefits that could be realized from construction of a dam.

2. Where weirs are considered necessary for industrial purposes they should be designed to permit the upstream passage of sport fish.

3. All action taken in the watershed should be undertaken in recognition of the need to minimize: soil erosion, disturbances to groundwater, interruptions of surface water infiltration, and surface runoff.

4. Channel edges and substrate materials should not be tampered with except when absolutely necessary and then at a time when fish habitat and sedimentation effects will be least harmful.

C. WATER USE

1. No water licence should be issued to authorize withdrawal of water from the river if the hydrologic functioning of the river below the extraction site will be impaired.

2. Annual inspections should be made of all water licences and reliable monitors should be developed to record withdrawal volumes.

3. Total amounts of licenced water withdrawal must not exceed the stream's capacity to function well at all times during which flow will be influenced by those licences.

4. Where weirs are installed on low flow streams, suitable designs or mechanisms should be used so that at all times when pumping is not essential an unobstructed channel is maintained to allow base level flow to proceed.

5. Water licences for the Little Red and other comparable rivers should be controlled so that withdrawals will not aggravate low flow conditions.

D. FLOODING, EROSION CONTROL AND CHANNEL ALTERATIONS

1. No flood hazard structures, septic tanks or other sewage handling devices and no waste materials should be permitted in areas which are prone to flooding during the 1 in 100 year flood.

2. Where the erosive action of streamflow is cutting away the shoreland and is thereby causing loss or hardship to the shoreland owner, appropriate armouring of the river bank may be a

suitable corrective measure. Except where such hardships occur, bank erosion is considered a normal function of rivers and its arrest is not encouraged. So unless it is absolutely essential, streambanks should not be dyked, riprapped, or channelized and the banks should not be altered. All such action or control must be under the direction and at the discretion of the relevant government authority.

3. As little vegetation as possible should be cleared from floodplains, and tree removal in the Streamway Corridor should only be permitted for ecological maintenance or grooming.

4. No work should be done that will change the course, current, or cross-section of a watercourse except when authorized by Alberta Environment and in harmony with general priorities for the river.

E. SHORELAND USE POLICY AND LEGISLATION

1. Shorelands should be so managed that the highest quality of experience (or use) may be realized at each site. The use of each site should be based on the specific characteristics of that site.

2. The first step in allocating uses along river valleys is to consider uses that are unique to the river and are not replicable outside its influence.

3. All areas which are particularly suited to specific functions should be identified so they will not be used for less desireable purposes or their capabilities impaired.

4. All uses along shorelands should be mutually compatible with each other and with the integrity of the riverscape.

5. A corridor to protect natural geologic, hydrologic and biologic processes which are characteristic of river channels and their immediate shorelands should be established as a first order management policy for rivers. This protected area should be called the Streamway Corridor and should include all wet and dry channels of the river plus the shorelands up to the bank-full level and an additional 10 meter wide shoreland fringe.

6. Along each watercourse having permanent streamflow, an extended shoreland area exists where stream related phenomena occur. This area should be defined as the Streamway Influence Belt. (S.I.B.) The minimum area defined by the S.I.B. includes the Streamway Corridor, the 100 year-return floodplain and a 100 meter wide floodplain fringe. Special management controls and operational measures should be applied to prevent uses of the area from causing undesireable effects on the stream or shoreland processes.

7. No permits for land or water use in a Streamway Influence Belt should be granted if the use does not reflect the objectives presented in an adopted management plan.

8. Existing legislation dealing with watercourses and water rights should be reviewed, publicized and enforced.

9. Regulations put forward in an adopted management plan for river shorelands should be designed to protect public health; control water pollution; protect spawning grounds; maintain fish and aquatic life; control subdivision and building on shorelands; regulate land uses; preserve shore cover and natural beauty; prevent soil erosion, and protect development from flood damage.

10. All changes in land use or increased intensities of use within the S.I.B. should require a development permit from the municipal council.

11. As a minimum level of protection along all permanently flowing watercourses the Streamway Influence Belt should be introduced as a standard for shoreland management. Under the terms of this minimum standard, the Streamway Corridor is not included. The S.I.B. can be introduced without a detailed inventory and analysis, although it may be desireable to establish priorities.

12. As stream shoreland protection becomes increasingly important, or as specific streams receive greater pressure, the Streamway Corridor should be designated, thereby preserving the channel and immediate shoreland.

13. A management plan which will ensure the continued or, where desireable, the restored integrity of the Little Red Deer riverscape should be adopted.

F. WATER QUALITY

1. Where effluents are to be discharged into a water body, the required treatment standards should be related to the intention of maintaining baseline water quality in the receiving waters rather than to their dilution capability.

2. Where dry-pit toilets are installed along shorelands they should be positioned beyond the floodline. Maintenance of these facilities should be to a standard that encourages their use.

3. Developed recreation facilities on shorelands should be equipped with sanitary sewage and waste handling facilities other than dry-pits. Commercial, institutional, church, municipal and private recreation developments are all included in this recommendation.

4. All practices which are prone to contaminate groundwater must be avoided throughout the watershed. Groundwater is the principal source of domestic water for basin residents.

5. Streambank foliage and its root system provides the final buffer (filter) preventing waste products of the land from reaching the watercourse. It also shields shoreland soils from erosion. This streambank vegetation ought not to be disturbed where it can be reasonably avoided.

6. No untreated domestic, industrial, municipal or agricultural effluent or sewage should be released into a stream. Treated effluents should not be released into any stream unless the point of outflow is at least 15 kilometers above a site where the water is required for domestic use, or for swimming, or is rated Class 1 or 2 for sport fish or waterfowl.

7. No effluents should be allowed to enter a water course in a state that will result in more elaborate treatment of domestic water extracted from that waterbody.

8. River shorelands should be managed so as to provide a reliable supply of clean water for aquatic habitat and downstream needs.

9. Sources of contamination, whatever their nature should be prevented from continuing to contaminate the watercourse. If necessary a stop order should be issued under the appropriate legislation.

G. UNIQUE AND CRITICAL AREAS

1. Unique, fragile and critical areas along rivers should be identified and protected.

2. Before major land disrupting activity is permitted to proceed, the site should be investigated to determine if any significant archaeological feature is present. Prime sites should be preserved.

3. Areas determined to contain benchmarks of river experience/integrity are highly significant and should be managed without compromise for their highest indicated function. Potential benchmark areas are confluence sites and incised reaches.

4. Particular consideration should be directed to the confluence units (A-1 and G-1) to retain their distinctive ecological and geomorphic features.

5. The habitat features in the vicinity of the Dogpound Creek confluence should be protected from damaging encroachments.

6. The Westward Ho Run should be managed so as to emphasize and maintain its natural vegetation, running water, topography, seclusion, and the socio-recreative benefits offered.

H. AGRICULTURE

1. Livestock and agricultural chemical wastes are major sources of pollution to water bodies. Agricultural practices should be required to minimize undesireable impacts on the bio-ecological base.

2. Livestock grazing, watering and trampling along the margins and into the channel of streams should be restricted.

3. In recognition of the natural transfer of agricultural chemicals from land to the water systems and the resulting effects these have on water quality and biological life systems in or dependent on the water in rivers, these agricultural chemicals should not be applied to grain or to land located in the Streamway Influence Belt.

4. Livestock confinement operations should be equipped with effluent holding lagoons of sufficient capacity to store all wastes and contaminated runoff from the confinement area if these wastes would otherwise drain into a stream or its feeder systems. The holding lagoons should have sufficient capacity to receive those wastes during the time required for adequate biological decomposition and to prevent emptying except during peak flow, if the effluent will enter the river.

5. In recognition of the impossibility of controlling the impact of unregulated livestock access to river shorelands it is recommended that they should not be permitted access into the Streamway Corridor for watering and grazing, nor should they be fed there during winter. An exception is considered appropriate for watering if the access point is located on gently sloping banks and the shoreline is resistant to erosion by right of being composed of coarse gravel or rock, or where a specific and confined portion of the shoreline can be conveniently modified to produce a gently sloping cobble bank and bed.

6. Effluent from livestock confinement facilities is capable of causing serious contamination of water, particularly when untreated or if it flows directly to the waterbody. It is therefore recommended that no livestock confinement operations should be located in the Streamway Influence Belt, (generally defined as 0.5 km. from the water's edge).

7. To the extent that agricultural pursuits are not incompatible with the capability of the shoreland conditions, and where water quality can be maintained, and the essential geologic, biologic and hydrologic components of the river's functioning will not be impaired, arable land should continue to be used for crop production.

8. Since shorelands seldom offer more favourable conditions for agricultural use than areas away from shoreland locations, agriculture should not be regarded as a preferential shoreland use. Shoreland conditions which are superior for agricultural uses (eg. livestock watering and shelter), are susceptible to frequent and progressive devastation.

9. As a positive step towards alleviating livestock caused damages to waterbodies and shorelines, shorelands should be fenced and offstream watering facilities should be installed.

10. In order to accelerate a program of shoreland and stream enhancement, and to alleviate the burdens on land owners who have traditionally based their livestock operations on the benefits of a streambank location, incentives should be developed to either compensate or subsidize him for costs involved in altering his livestock rearing practices to reduce or remove the negative impacts they have on the streamway.

I. LAND OWNERSHIP

1. The extent of public domain along rivers should be clearly defined and publicized so that the landowner and the public have a clear understanding of their rights and territorial limits. A suggested limit for the shoreline public domain is the bankfull height of the channel including the stream bed and all water in the stream. The bankfull height is the level at which the water spills over its banks at either side and flooding occurs.

2. As riparian rights are the defined water privileges vested in shoreland property ownership, so also there should be explicitly documented riparian ownership responsibilities.

3. Trespass violations must be more clearly defined and publicized and adequately policed. Trespass should be redefined to remove the onus from the landowner and place on the intruder the responsibility to acquire authorization to gain entry.

4. Critical and high amenity shorelands should be brought into Crown ownership to increase public recreation opportunities and to extend opportunities for habitat maintenance.

5. The co-operation of all land owners and users along the Little Red Deer River should be secured so that all will seek to manage these lands in a sensitive manner. Public recognition and credit should be provided to all who do co-operate.

J. SUBDIVISION OF LAND

1. The Planning Act provides for special review of shorelands considered for subdivision and development. This is highly appropriate, especially for residential development, but should be more aggressively pursued with respect to other forms of shoreland development. Included in these concerns are gravel mining, oil and gas wells, intensified agricultural operations and roads.

2. Approvals of subdivisions for new residential development should be linked to a formula requiring development to specified standards and within a predetermined time period.

3. No shoreland area should be subdivided if it is unsuitable for the intended use because of flooding, poor drainage, erosion potential, sewage disposal complications or any other feature likely to be harmful to the health, safety or welfare of the resident, or to the continued healthy functioning of the river and its shoreland processes.

4. Where residential subdivisions of shorelands are approved a 50 meter wide environmental reserve should be set aside and protected.

K. RECREATION

1. Recreational canoeing on the Little Red Deer River is severely restricted by naturally low flows. These segments of the river with sufficient water for canoeing should be kept free of man-made cross channel obstructions and bank disfigurements.

2. A modified version of the International White-water Rating System used for rating the difficulty of rivers and rapids for paddling should be applied to all navigable streams.

3. Before any recreation facility is developed in any rural area, including river shorelands, the effect of such a facility on existing uses or users adjacent to the development site must be determined. All new or expanded facilities for recreation should be so located, designed and managed that no undue disruption to the surrounding rural experience or existing uses is caused.

4. The Minimum Standards for Campgrounds prepared by Travel Alberta in 1976 or else other equal or superior standards should be the standards guide for all campgrounds developed along river valleys.

5. In response to its rich natural suitability for public recreation, its proximity to urban areas, and its well developed access, C Run, which is located between and includes Silver Lagoon and Red Lodge Park should be managed as a first priority area for expanded recreation facility development. No development for any alternate function should be allowed in this run until a recreation scheme is fully explored.

6. Opportunities for public recreational use should be available on the public domain that exists along watercourses.

7. Facilities for recreation developed along shorelands should be of a type and nature that relates to the local natural resource base.

8. Minimum standards of management and supervision should be required in all recreation areas.

9. Facilities for camping should be designed and equipped so that users may engage in activities that are enhanced by the site characteristics and not be confined exclusively to the constraints of the campground site.

10. In recognition of the increasing numbers of recreation vehicles, as well as the increasing mobility of the camping public, there should be a major thrust to increase the number of campgrounds capable of accommodating all types of campers.

11. H-Run is primarily suitable for recreational functions. The shorelands there and their natural amenities should be managed for the recreational benefits they offer.

12. Along the Little Red Deer River valley there should be a system of walking and cycling paths linking developed recreation nodes and occasional discreetly placed and unroaded picnic sites.

13. At least one major public campground should be developed along the Little Red Deer River between the Green area boundary and the Forestry Trunk Road.

14. Recreation should be recognized as a high priority function on river shorelands. The endowment of river shorelands with a complex of water, local relief, and a diversity of trees provides the natural base around which many recreational pursuits are preferred.

15. In developing recreational facilities along the Little Red, a balance should be sought among weekend, day use, destination, private and public use facilities.

16. Snowmobiling should be recognized as an acceptable form of outdoor recreation on the snow covered river surface. Winter camping facilities associated with snowmobile travel should also be considered at specific sites.

17. Private owners of shoreland property should be given incentives to examine the recreational opportunities that may be available on lands which they own.

18. Programs to evaluate outdoor recreation needs should be carried out.

L. WILDLIFE

1. Where weirs on bulkheads are required for water extraction, their placement and design should not impede the upstream movement of sport fish.

2. Shoreland activities which induce sediments, chemicals, or silt into sport fish habitat should be corrected.

3. Agricultural practices which accelerate erosion, increase the load of noxious chemicals, stimulate eutrophication, or deprive habitat of tree shade should be regulated out of consideration for aquatic life.

4. Beaver populations along rivers should be maintained but controlled. Excess populations denude shorelines of scenic and shade producing cover and the dams create conditions unfavourable for sport fish.

5. River valleys provide vestiges of formerly extensive habitat used by several wildlife species. They also supply critical mating, rearing and shelter areas. These habitat areas should be managed so these values may be retained.

6. A perennial refuge for wildlife should be preserved in the Little Red Deer River valley and the wildlife in these refuges should be kept from increasing beyond the capacity of the habitat or declining to the extent where they are no longer viable.

M. RESOURCE USE

1. The forest products industry and forest management agencies should be commended for the measurers adopted to minimize the detrimental impacts of tree harvesting on watershed values.

2. Shoreland timber harvesting controls should be used as a model from which to draw up regulations to control other types of resource use along the margins of water bodies.

3. The Environment Council of Alberta should be requested to investigate all aspects of river shoreland and streamway environment management so as to derive policies that will provide adequate control on these high value and sensitive areas.

4. Any human use of shorelands should occur in a manner that achieves the best fit between the resource and its use, thus diminishing the resource to the least while satisfying the user/use to the greatest degree.

5. Pipeline crossings of rivers should be minimized. This can be done by grouping several pipes into one crossing or running the products from several wells into one pipe.

6. All decisions to allocate resources along river shorelands should be qualified by the over-riding importance of maintaining or improving water quality and flow reliability in the stream and preventing erosion of the shoreland soils.

N. PROGRAMS

1. A program to identify and designate a system of river classification in the Province of Alberta should be initiated, and measures to manage them as classified should be introduced.

2. Research programs to develop methods of practically and beneficially applying both agricultural and municipal sewage to agricultural land as fertilizer should be encouraged and accelerated.

3. Research should be pursued to determine the impacts of various activities on shoreland and streamway environments.

4. A program to establish clearly defendable levels of intensity for recreational developments along shorelands should be pursued.

O. ACCESS

1. Use of off-road vehicles along river valleys should be restricted to designated areas rather than considered a general privilege except when explicitly forbidden.

2. Private (or even public) fords of the river bed which are intended to provide occasional access to lands or facilities on the opposite bank, should be carefully located where harmful effects to the stream bed will not result. Where necessary these sites should be improved by gravel inlays and bank shaping to lessen their undesireable impacts.

3. All forms of off-road travel using motorized vehicles on private property should be restricted to authorized access gained by permission or invitation from the land owner. No land owner should be required to prove that access rights were not granted, nor should he be liable for any damage occurring during unauthorized access.

4. Means of controlling and, if possible stopping unauthorized off-road vehicular access onto private property should be developed. An example of a potential, but superior control measure would be to grant the property owner such privileges as are necessary to detain the vehicle operator and sieze his/her vehicle so long as the offender's safety is not threatened. All items seized from an offender would thereafter be turned over to the R.C.M.P.

5. Where areas identified in this study as having a good potential for use lack accessibility, they should be provided with adequate access. Access for industrial resource developments should be designed so that appropriate public and recreational access needs are also served.
6. No fences should be strung or erected across a navigable watercourse. Where livestock watering is permitted in the stream, fencing may be used to restrain the cattle from crossing, or wading excessively far into the watercourse.
7. Where bridges are constructed over a watercourse a section of the shoreland on each bank should also be spanned by the bridge to allow the passage of wildlife along the shoreline.

P. THE GREEN AREA

1. Snowmobile traffic in the Green Area should be confined to designated use areas and to the snow covered surfaces of stream channels.
2. Residential development in the Green Area should not be allowed except for resource development staff or administrative personnel and should be restricted to the productive life of the development.
3. First priority for land use management in the Green Area, including the shorelands and channels of streams should continue to be watershed maintenance.
4. Where livestock graze the watershed of any permanent watercourse, the owner of these livestock should be required to fence off the Streamway Corridor and restrict access of these animals to specific watering sites where damage to the streambank and the stream's ecology will be minimized.

Q. ENVIRONMENTAL PROTECTION

1. Corrective action should be taken to restore or correct both past and present situations of environmental/ecological abuse.
2. Surface disturbing uses should not be pursued on areas where vegetation and soils are fragile even where the disturbing activity is a traditional form of land use.
3. Shoreline vegetation removal should be restricted along the entire length of the river.
4. Intensive use activities ought not to be pursued at any location until all of the requirements for preservation have been satisfied.

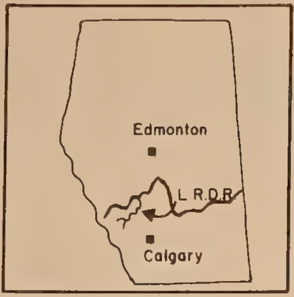
R. OTHERS

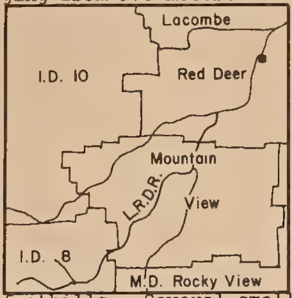
1. Additional recommendations in the report take the form of goals, guidelines, standards, objectives and targets. These are found in the main text of the report.

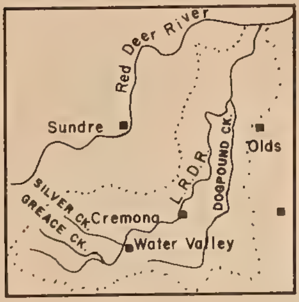
4 GEOGRAPHIC OVERVIEW

GEOGRAPHIC OVERVIEW

LOCATION

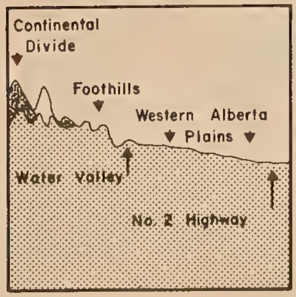




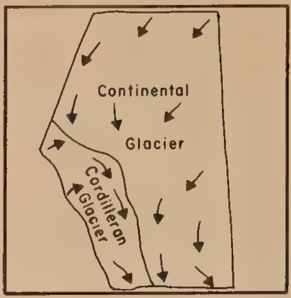


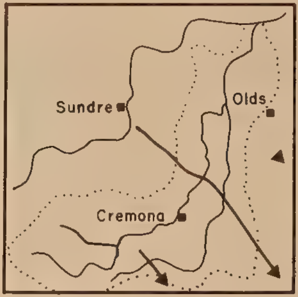
The Little Red Deer River basin is located in south central Alberta, occupying a central and westerly portion of the County of Mountainview as well as a small portion of the County of Red Deer. Its rather extensive headwaters and merging tributaries however, gather from the eastern foothills ridges in I.D. No. 8. The river drains an area of approximately 2352 square kilometers with topographic variations ranging from 970 meters elevation at the confluence of the Red Deer River to 2000 meters at Mockingbird lookout tower. Two main physiographic regions are represented. The foothills region extending east to the confluence of Silver Creek, is drained by the mainstem of the Little Red Deer and also Grease Creek which merges with it before leaving the foothills. Several smaller ephemeral streams and Silver Creek also drain the foothill region. The Western Alberta Plains extends north and east from its border with the foothills to beyond the mouth of the river. A major tributary in this region is Dogpound Creek. This report deals mainly with that portion of the Little Red Deer basin in the Counties of Mountain View and Red Deer, excluding Dogpound Creek.

GLACIATION

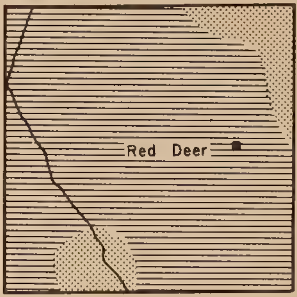


There are many processes responsible for the present topography in the Little Red Deer River basin. The most outstanding of these processes is the emergence of the Rocky Mountain Foothills and the relatively recent continental glaciation. For the last several millions of years most of Alberta has been subjected to advancing and retreating continental glaciers which originated in the Arctic and subarctic areas or on the high elevation region of the Cordillera to the west. The latest of these advances, known as the Wisconsin glaciation retreated from the Little Red about 12,000 years ago, but during its greatest extent was probably as much as 2,000 meters thick. The effect of glacial scouring and postglacial sedimentation was to generally subdue the topography of the foothills and lowland areas and contribute to the extent and number of meltwater channels that are present in the basin. Glacial till, a combination of pebbles, stones, boulders and clay, formed from pulverized bedrock and other surface materials, was left strewn to various depths over the landscape after the ice melted. Meltwater from the melting ice carried and distributed various textures and quantities of gravels and sand along their course while fine blankets of clay settled into the huge water bodies, long since gone, that were stored between the ice and natural ridges on the landscape. In all instances, these are the parent material of the soils that now overlay them throughout the basin.



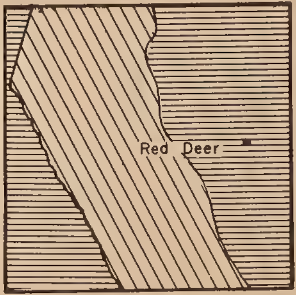


Meltwater Channels



Cambrian

During that period while ice covered the area existing rivers did not flow. Also, as the ice melted and its snout receded northward and westward, those rivers which currently flow northeasterly, were not permitted to do so, even though the land sloped in that direction. Due to the massive ice embankment, the Little Red Deer River was diverted to the southeast and other rivers, no longer present in the area



Devonian

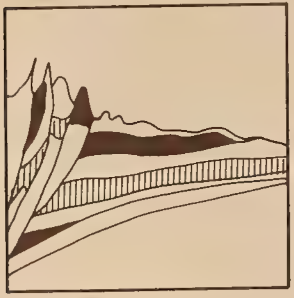
also drained away the glacial meltwater and in doing so, carved rather large, but presently dry valleys across the landscape. These are conspicuous yet and are known as glacial meltwater channels. One is crossed by Highway 27 west of Olds, another is present south and west of Water Valley. McDougall Coulee is a meltwater channel and so is the valley now flooded by the Elkton reservoir.

Triassic

GEOLOGIC HISTORY

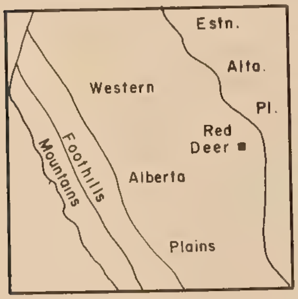
The geologic history of the basin, though lengthy requires but a brief account. During the Cambrian Period an extensive sea occupied the entire southern and western part of the province. By the middle Devonian Period, however, shifting surface elevations produced a ridge of land along the western margins of the province and a vast swamp and marsh to the east. As topographic shifts continued this relationship was reversed during the Triassic Period and during the late Cretaceous Period much of present day Alberta had elevated so that only the southeastern part remained under the sea. As a result of these fluctuating seas and shifts in the earth's crust a layering of marine and nonmarine sediments was deposited. The topmost layer was laid down during the Tertiary Period. Along the Western Alberta Plains these sedimentary formations are dipping gently to the west, but in the foothills, considerable folding and faulting has occurred resulting in the uplift of the mountains and foothills.

Cretaceous



Tertiary

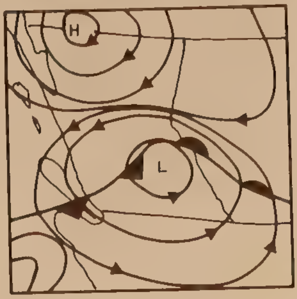
Along the Western Alberta Plains the Paskapoo formation, which is lower Tertiary in age predominates. This formation consists chiefly of soft clayey and calcaceous sandstones and soft shales and clays. It was laid down under a fresh water sea but is occasionally overlain by material of medium to high lime content. The western portion, including the foothills consists of shales, sandstones and limestones. It was during the late Tertiary period that the foothills were uplifted.



Present

CLIMATE

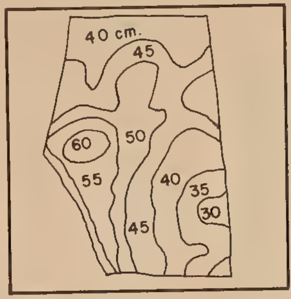
The climate of the basin is classified as continental, characterized by cold, snowbound winters and short, cool to warm summers. It is primarily influenced by latitude, distance from the ocean, altitude, and by the direction of the prevailing winds. The basin falls into the central belt of the northern, cool temperature zone, it is landlocked and much of it is invaded by cold air masses from the north during the winter season. It is partially shielded by the mountains from Pacific Ocean influences while also experiencing somewhat subdued chinook benefits occasionally.



Heavy Snow

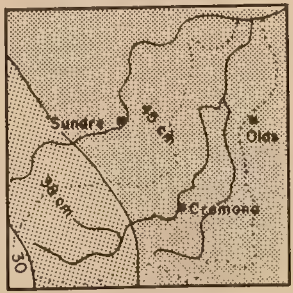
Heavy Rain

Prevailing winds being from the west, the basin lies in a rain shadow from the mountains. It can however, be invaded by warm, moist air from the southeast, which can produce intense rainfall on the foothills as it rises over them. Summer precipitation accounts for 60% of the annual total of approximately 55 cm.



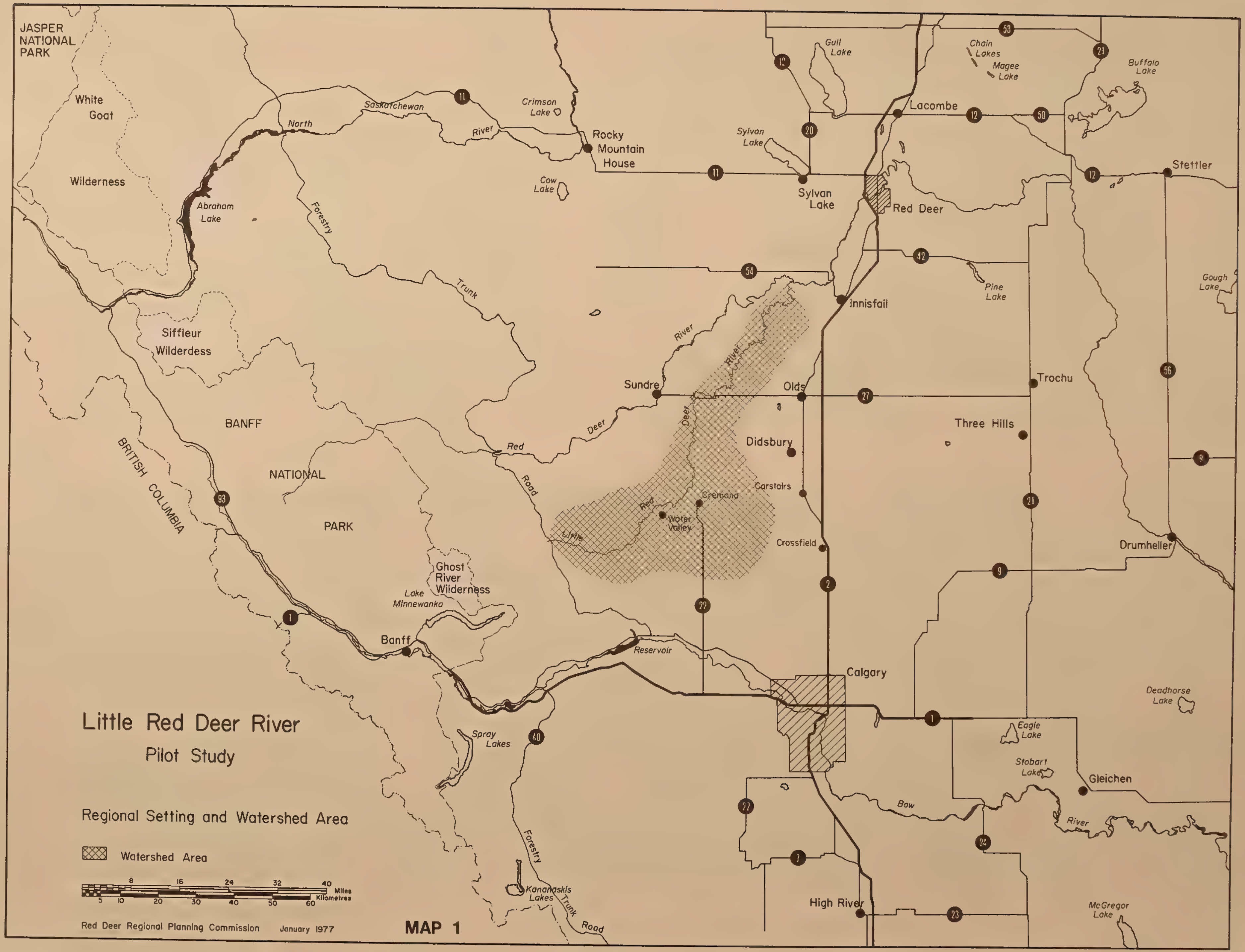
Annual Precip. cm

Extremes of temperature in the basin range between a maximum monthly average of 16°C in July and a minimum monthly average of about -12°C in January. Extremes in daily temperature can range well over 30°C during any year. The last spring frost in the western plains occurs during the middle to latter part of June while the first fall frost tends to occur in early September and late August. The frost free period averages upward to 90 days. Between 2100 and 2200 hours of sunshine per year are experienced.



Potent. Evapotrans.

Precipitation varies somewhat over the basin according to elevation. Mean annual precipitation over the foothills is between 55 and 70 cm depending on the exact location while out on the western plains it drops to approximately 50 cm. During the summer season, however, its distribution and amount is fairly even throughout the basin averaging about 35 cm annually



Little Red Deer River

Pilot Study

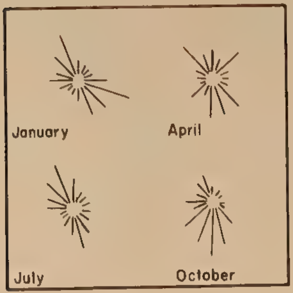
Regional Setting and Watershed Area

▨ Watershed Area

Red Deer Regional Planning Commission January 1977

MAP 1

but with a variability of ± 35%. Long term records indicate that in parts of the basin over 40 cm have fallen during a single 24 hour period. Unfortunately, the Little Red Deer River basin is almost centrally located in the highest hail risk part of the province.

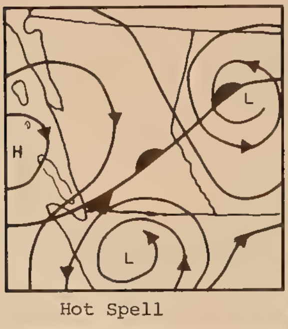


Wind Frequency

Potential evapotranspiration averages between 45 and 50 cm per year but after storage of moisture in the soil and the overland runoff a surplus of between 10 and 50 cm may be experienced at different times, with the higher surplus occurring farther west. Due to the depletion of soil moisture by evapotranspiration and overland or stream flow, water deficiencies of between 5 and 10 cm occur during the growing season. The greater deficiencies are evident along the eastern margins of the basin.

Cold Spell

An important factor influencing temperature and precipitation in the basin is wind and the influence of the Rocky Mountains on it. The prevailing winds are from the west-southwest and northwest. Still local winds vary considerably in both speed and direction and shifts frequently occur as weather fronts and high or low pressure cells move across the basin.

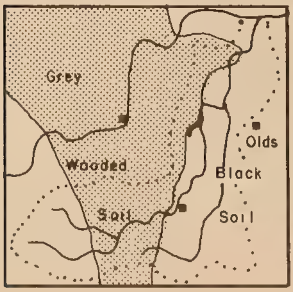


Hot Spell

Occasionally, warm dry chinook winds drift across the basin causing sudden winter temperature rises. The opposite phenomenon, a sudden shift to cold temperatures occur when the Arctic cold front carries icy cold north winds into the area.

SOILS

Black soils dominate the Western Alberta Plains part of the basin. These soils generally average about 10 inches of rich black soil although the thickness tapers off toward the west as thin black soil transitional to dark grey soil. Black soils are rich in nitrogen and organic content and are suited to sustaining a wide range of crops.

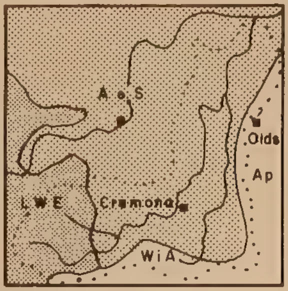


Soils

West of a line extending from Cremona to Westward Ho and Garrington, the soils conform to the dark grey and grey wooded group characteristics. Pockets of these soils are also evident at various locations in the thin black transitional soil areas. These dark grey and grey wooded soils are less productive, sustaining grassland and trees, particularly coniferous trees or else forage crops when improved through clearing, breaking and seeding.

VEGETATION

The Little Red Deer Basin extends into three major vegetation associations, namely: lodgepole pine - white spruce - engleman spruce; aspen ecotone to white spruce; and willow and aspen scrub. Typical of aspen ecotone to white spruce, there are numerous and often dense and extensive stands of aspen poplar although the river shorelands themselves are probably equally heavily overgrown with white spruce. Associated trees include balsam poplar and white birch while alder, willow, chokecherry and saskatoons are the most common shrubs. Farther west and south however, conifers progressively dominate the landscape with lodgepole pine and white spruce being the most common species.



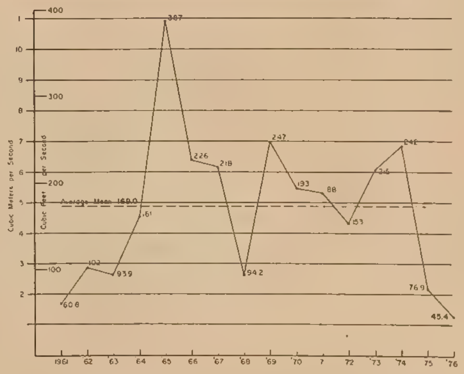
Vegetation

Prior to 1890 very little agricultural clearing had occurred and so the shorelands of the Little Red were supporting continuous stands of trees. While much of those shorelands are still covered with native trees, most of the river bottom flats and low benches have been cleared for cultivation or forage production. Clearing is still occurring at numerous sites north and east from Water Valley and commercial logging is pursued at isolated locations upstream from Water Valley. The forested foothill part of the basin is rated Class 4 and 5 for forest capability, by the Canada Land Inventory, a rating that is about average throughout the foothills and is moderately good for commercial operations.

HYDROLOGY

The Little Red Deer River exhibits a very high variability in its flow. Two guaging stations, one near Water Valley and the other, west of Innisfail have been recording streamflow since 1961 and 1960 respectively (Tables A and B). As is demonstrated on Figure 2, the flow has been significantly below the mean during 6 of the 16 years of record.

Mean Annual Discharcharge at Mouth 1961-1976



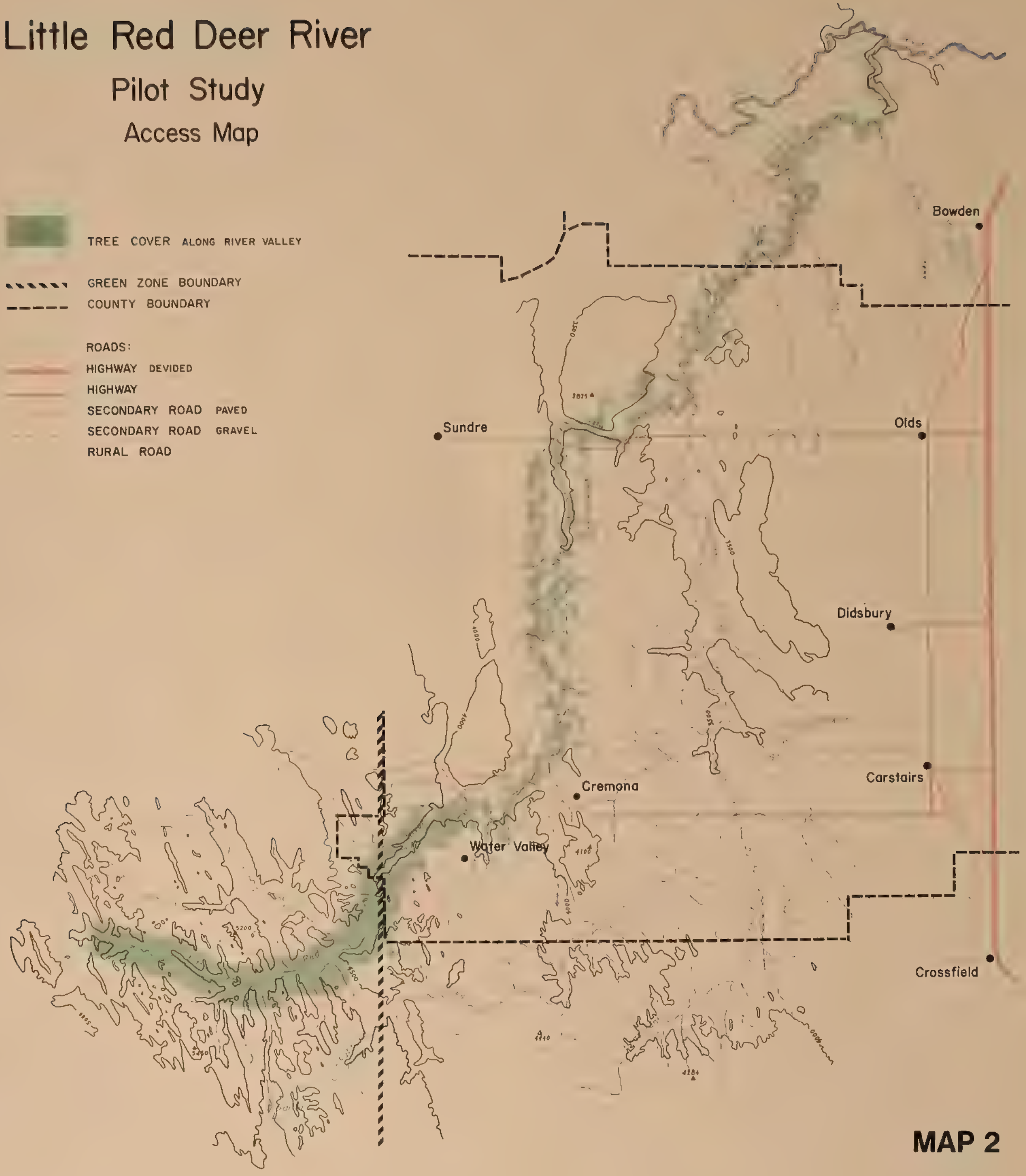
Source Water Survey of Canada, Environment Canada

Figure 2

Little Red Deer River

Pilot Study

Access Map



MAP 2

TABLE A

Monthly and Annual Mean Discharges in Cubic Meters per Second

Little Red Deer River - Water Valley
1964 - 1976

Year	March	April	May	June	July	Aug.	Sept.	Oct.	Mean	Total for Year# dam^3
1964	0.09	1.46	8.07	5.55	6.48	0.85	0.89	0.70	3.00	63772
1965	0.14	3.57	2.01	+ 9.66	13.88	+ 5.21	+ 5.27	+ 3.31	+ 5.38	113729
1966	+ 1.04	1.20	3.40	5.13	5.75	2.52	1.04	0.71	2.60	55137
1967	0.40	* 0.77	9.29	9.34	1.85	0.86	0.39	0.50	2.92	61798
1968	0.57	0.89	* 1.21	2.38	1.10	1.77	1.18	1.66	1.34	28494
1969	0.62	4.39	4.87	7.82	+ 14.02	2.11	1.08	0.94	4.47	94980
1970	0.29	1.57	3.57	8.89	3.17	0.74	0.68	0.67	2.43	51560
1971	0.20	3.34	1.41	4.47	1.21	* 0.40	0.44	0.41	1.47	31208
1972	0.37	1.35	2.17	6.37	5.01	1.78	1.50	0.98	2.43	51560
1973	0.80	2.89	9.32	6.23	2.21	1.04	0.90	0.78	3.03	63895
1974	0.32	+ 5.75	+ 13.85	4.08	1.75	1.30	1.05	0.97	3.62	76970
1975	* 0.08	0.98	2.64	* 1.16	0.72	0.56	* 0.33	* 0.34	* 0.85	18009
1976	-	2.06	1.49	1.19	* 0.44	1.85	0.68	0.40	1.16	21340
Mean	0.41	2.32	4.87	5.56	4.43	1.61	1.19	0.95	2.67	732452

TABLE B

Monthly and Annual Mean Discharges in Cubic Meters per Second

Little Red Deer River near the Mouth
1960 - 1976

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean	Total For Year# dam^3
1960	-	-	-	-	-	-	-	1.67	0.84	0.94	0.63	0.39	-	-
1961	0.78	0.53	2.70	* 3.34	6.82	* 1.31	0.78	1.42	* 0.60	1.55	0.53	* 0.16	1.72	54274
1962	0.14	* 0.04	3.48	7.79	5.72	3.45	5.92	2.83	2.00	1.08	1.37	0.67	2.89	91032
1963	0.12	+ 3.03	3.77	5.64	2.32	5.64	5.61	3.06	1.59	0.76	0.29	0.20	2.66	83755
1964	0.21	0.07	0.78	4.96	17.90	12.46	10.56	1.56	1.82	1.60	1.80	0.68	4.56	144319
1965	0.18	0.10	7.99	32.85	4.22	16.96	+32.85	+10.22	+13.11	+ 7.67	+ 3.54	+ 1.94	+10.96	345380
1966	1.14	1.00	+ 9.12	8.69	9.37	11.50	18.38	6.65	3.09	3.40	2.44	1.35	6.40	202294
1967	+ 1.23	0.99	1.17	16.08	22.40	21.29	4.59	2.24	1.01	1.41	1.15	0.42	6.17	194893
1968	0.48	1.74	3.74	3.91	2.97	4.87	2.86	3.43	2.21	3.28	1.82	0.69	2.67	84371
1969	0.56	0.42	0.61	25.74	9.32	9.71	24.61	4.22	2.73	2.60	2.30	1.00	6.99	220797
1970	0.51	0.32	3.77	8.18	7.56	+25.20	12.54	2.48	1.80	1.98	0.89	0.37	5.47	172690
1971	0.52	0.91	1.48	+34.83	5.32	14.05	3.26	* 0.94	0.80	1.12	0.87	0.20	5.32	167756
1972	* 0.08	0.05	8.83	8.16	4.67	11.36	9.37	3.60	2.39	2.20	0.98	0.33	4.33	136919
1973	0.35	0.54	8.61	23.98	15.60	10.19	5.49	2.40	2.30	1.69	1.00	0.90	6.09	192426
1974	0.67	0.63	0.75	27.92	+31.43	8.58	3.77	2.42	2.11	2.08	1.26	0.56	6.85	215863
1975	0.33	0.20	* 0.09	11.27	7.67	2.48	1.12	0.96	0.62	* 0.62	* 0.28	0.21	2.18	68706
1976	0.32	0.43	0.63	4.79	* 2.16	1.61	* 0.50	2.39	0.86	0.89	0.57	0.32	* 1.29	40706
Mean	0.48	0.69	3.60	14.26	9.72	10.04	7.12	3.09	2.35	2.05	1.28	0.61	4.79	151011

+ Highest Mean

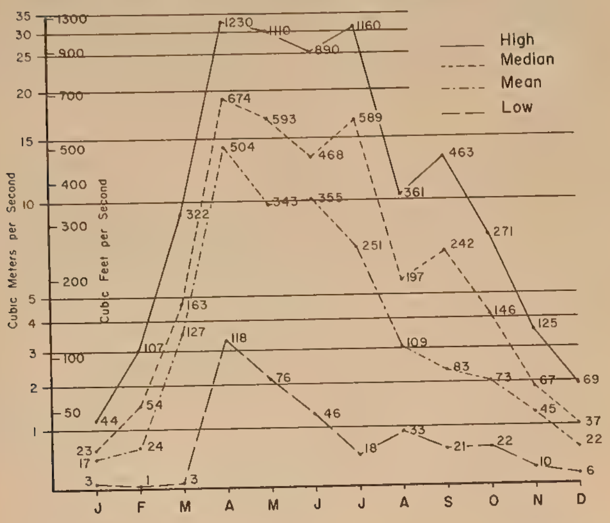
* Lowest Mean

# Cubic decameters is the International System's unit for water volume comparable to acre feet.

Source: Water Survey of Canada

One year (1965) had flows that were significantly higher than the mean. Considerable variability of flow is particularly demonstrated throughout the year.

Mean Monthly Discharge at Mouth



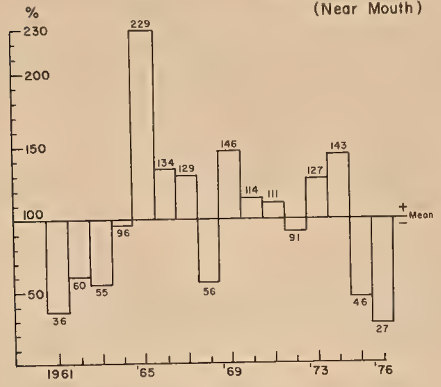
Source: Water Survey of Canada, Environment Canada

Figure 3

Extreme deviations from the mean flow occur in both above average and below average flow years. However, in above normal, below normal, or normal flow years, the total flow in the river tapers off sharply after a second peak that tends to be in June or July.

Annual Discharge

Expressed as percentages of Mean Annual Discharge (Near Mouth)



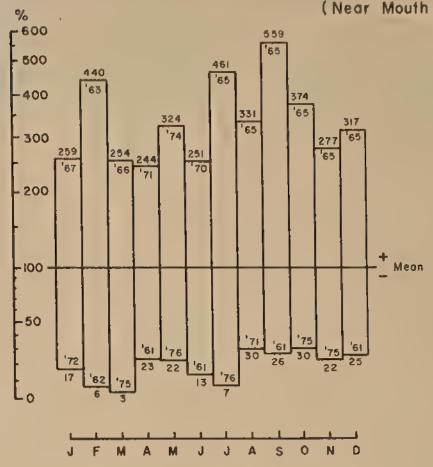
Source: Water Survey of Canada, Environment Canada

Figure 4

Over the period on record, however, there is even a conspicuous difference in streamflow from year to year during any month. For any given year too, records show that water levels can fluctuate quite rapidly. Two peaks usually occur, but any high flow event may have two or more sub-peaks. The first peak is a response to snowmelt runoff from the Western Alberta Plains part of the basin. This runoff occurs between Mid-March and early May generally lasting only a few days. A second peak depends on spring rains throughout the basin and snowmelt from the foothills and is experienced sometime between late May and early July.

Monthly Max./Min. Discharge

Expressed as percentages of Mean Monthly Discharge (Near Mouth)



Source: Water Survey of Canada, Environment Canada

Figure 5

Although a marked tapering off of flow is common following this second peak, normal late summer flows usually extend into November before declining to the meagre volumes characteristic of the winter period. However, during unusually dry summers or when the snowpack in the foothills has been very light, the flow may drop to its normal winter level by late summer. Records for both 1975 and 1976 demonstrate this condition.

During recent years the flow levels of the Little Red Deer River have been somewhat lower than the recorded average. The results are fairly complex and are evident in the water quality, fish populations and recreational appeal of the stream. Since records do not exist prior to 1961, we can only presume that low flows were as common previously as they are during the period of recorded flow. These occurrences are also directly related to the total hydrologic cycle involving snow, rain, temperature and wind. To some extent, extraction of water from the river lowers the flow, but in most instances the pumps operate during high flow periods and do not significantly interrupt overall conditions. For a stream the size of the Little Red Deer, it would not require too many pumps to remove all of the water during low flow.

Flooding and erosion are problems that relate closely with streamflow. Neither have been identified as critical issues requiring corrective or preventive action. Certainly floodplains are susceptible to periodic inundation so activities on them should be pursued with an awareness of the risks and interruptions that may occur. Erosion too, progressively takes its share of shoreland along the immediate river bank. This is most evident on the outer sides of meanders and proceeds most rapidly during periods of peak flow. Erosion is the very process that produced a river channel and the process will persist.

High flow in the Little Red, August, 1954.
Photo courtesy of K. Hocken, Innisfail.

Certainly a stable or at least a reliable flow of water in the river would have some benefits; however, over the period on record or even through history, as remembered by residents and documented in various literature, the vagaries of flow in the Little Red are not seen as a major problem. The only possible means of regulating flows would be by placing a major dam on the river. However, the costs, productive land lost and disruptions produced are not considered to be warranted by any benefits that could be realized.

GROUNDWATER

Map No. 5 shows the possible and probable well yields from the groundwater aquifers adjacent to the Little Red Deer River. Using flow regime characteristics and lithological data, an estimate of possible groundwater yields is made. Where actual pump and bail tests have been done, yields are expressed as probable, implying greater reliability. Actual wells drilled in the area will not necessarily produce yields comparable to the mapped figures since this degree of accuracy is only possible by pumping from a drilled well.

Predicted average yields vary widely throughout the basin. Relatively low yields (25 - 125 litres/minute) are expected for the greater part of the map area. One very localized area in the vicinity of Eagle Hill may yield in excess of 2500 litres per minute but much of the mid-portion of the study corridor would yield between 125 and 500 litres per minute.

Groundwaters in this area generally carry some amount of calcium, magnesium, bicarbonate and some localized areas have sodium-potassium bicarbonate. Since neither sulfates or chlorides are present and the total dissolved solids are below 1000 parts per million these groundwaters are recognized as being of good quality.

Groundwater is the source of domestic water throughout the study area. Most farms have their own water well, although livestock, particularly cattle raised near the river are watered at the river itself. In addition to domestic water supply for farms, all of the church camps, country homes, and cottages as well as the hamlets of Water Valley, Cremona, Harmattan, Westward Ho and Eagle Hill get their water from wells. The public water supplies at the campgrounds and Red Lodge Provincial Park are also from wells. In all instances the supply is considered acceptable although local users have reported that in some locations yields have been declining gradually. This trend, if it really exists, could be due to increased pumping from the aquifers or a response to a sequence of somewhat drier climatic conditions causing a lowering of the water table.

FISH

Fish are not plentiful in the mainstem of the Little Red Deer River. Those species that do exist are present in decreasing numbers closer to the mouth of the river. Some local opinion indicates that sport fishing success has been declining during their experience. Yet the Little Red Deer River is as large a stream as many productive streams elsewhere, and is certainly larger and seemingly healthier than some. Still, most fishing success in the basin tends to occur from the tributaries, such as Harold Creek, Grease Creek and Dogpound Creek. In researching these waterways for the Canada Land Inventory program the Fisheries biologists found most of the streams quite well suited to sport fish. A summary of the ratings is shown below: [1]

BEAVERDAM CK. Class 4

- heavily grazed unstable banks denuded of vegetation - erosion occurs, severe fluctuations of flow, no fishing.

STONY CK. Class 4

- good bank cover of poplar and willow, narrow channel, grazing on banks, no fishing.

GRAHAM CK. Class 3

- small, shallow valley, spruce and poplar vegetation, fairly stable banks, little erosion, some cultivation and grazing.

TURNBULL CK. Class 1

- banks covered with willows, free of erosion, partially shaded, some grazing, stocked with Brown trout.

SILVER CK. Class 2

- well vegetated banks, cattle graze throughout, some fish habitat improvement attempted, upstream portion is a flat, wet valley, some erosion.

GREASE CK. Class 2

- valley bottom covered with willows and grass, heavily grazed, some shade, some erosion and siltation, algae scum buildup.

ATKINSON CK. Class 2

- forested with good grass turf, heavily grazed, some shade, firm banks, beaver dams.

SHELTER CK. Class 2

- valley floor covered with grass and willows, livestock grazing, stable banks, good shelter.

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1. These data were gathered for the Canada Land Inventory Sport Fish Capability Inventory by the Fish and Wildlife Division, Alberta.

HAROLD CK. Class 2

- valley bottom covered with grass and willows, heavily grazed, erosion evident.

BIG PRAIRIE CK. Class 2

- valley bottom covered with poplar, spruce and willow, some cultivation, grazing, little erosion.

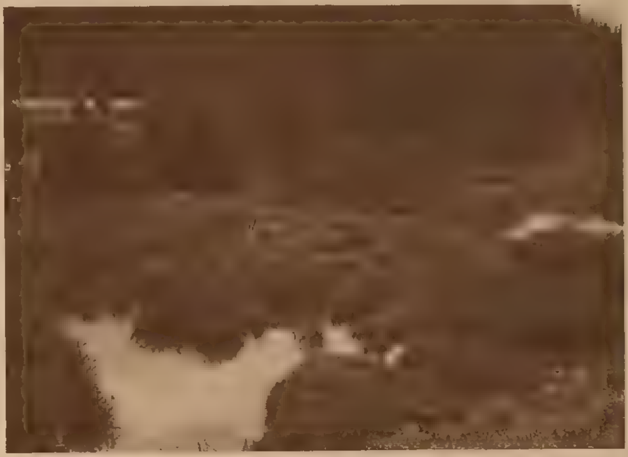
For the angler, brown trout have provided the main appeal, although some goldeyes, mountain whitefish and pike do occur. Two or three species of suckers are present, and the red-backed ones may constitute as high as 75% of the total fish population in the lower reaches of the Little Red. The brown trout have been placed into the tributaries as hatchery stock and are not native to the streams. Their rate of survival is subject mainly to conditions of the streams.

Several factors contribute to the quality of the fish habitat. Water temperature is a major factor particularly for trout as any warming of the water introduces a threat to their survival. In this respect, a heavy and continuous stand of shoreline vegetation is essential to maintain a shaded stream environment. Tree removal to allow cultivation or development of any type adjacent to the stream aggravates this situation. Secondly, mud and silt in the stream are undesirable. First of all, silty water offers an unattractive swimming and breathing medium for fish. Secondly, murky water attracts and concentrates heat in much the same manner as any dark surface. And thirdly, silt settles down over the spawning and feeding beds at the bottom of the river resulting in declining reproduction success and poorer feeding opportunities. All activities and events that add to the silt load contribute to a declining fishery. Agricultural practices have been identified along Dogpound Creek, Harold Creek and the entire length of the Little Red Deer as the prime cause of siltation. Livestock trampling of stream beds and banks as well as cultivation of land immediately adjacent to streams induce erosion which generates a high silt load. Fourthly, there is the chemical (or physiochemical and biological) quality of the water. Certain elements in the water can be tolerated by aquatic species while others cannot. Some cannot be tolerated in an indirect way. Certain natural concentrations of calcium are probably a limiting factor for trout. Other chemicals, such as feed into streams from animal wastes and fertilizers, pesticides and herbicides may, in themselves poison fish or else increase the rates of plant growth in the stream to the extent that they consume all of the available oxygen leaving an insufficient supply for fish. Studies done by the fisheries biologist have identified all of these problems along the tributaries of the Little Red Deer, and conditions on the Little Red Deer itself are largely the same. Finally, beaver have been very active throughout this basin. Although beaver dams offer a suitable place for trout growth they also slow the rate of flow resulting in localized siltation of the spawning gravels. This eliminates trout spawning while, at the same time, enhancing the spawning environment for such undesirable species as suckers, pike, dace and chubs. Furthermore, where this reduced speed of flow at beaver dams occurs, the large invertebrates that are used as food by trout are destroyed. Although beaver dams are a product of naturally present agents, their impact is not in harmony with trout habitat.

WILDLIFE

The Canada Land Inventory rates the capability of the Little Red Deer Valley to sustain ungulates and waterfowl. These are very generalized forms of information and also fail to present anything related to upland birds, predators, rodents and furbearers.

Beaver are evident throughout the length of the river with concentrations occurring at some sites to the extent that considerable destruction has resulted. Several beaver dams are constructed across the mainstem upstream from Elkton and tributary channels are frequently dammed.



Beaver dams are common on the Little Red and its tributaries.

South and west from Water Valley the frequency and magnitude of dams increases. Muskrat also inhabit this stream in some quantity, it not being unusual to see them near the river's banks. Occasional wild mink also persist in the area.

Although cougar are believed to still occasionally move into the valley of the lower Little Red, and lynx, bobcat and black bear have been seen, the coyote remains the principal problem species. West of Water Valley, wolves are considered by some to have increased substantially in number.

With these populations evident in the basin 4 or 5 individuals actively supplement their income by trapping. In addition to these, there are teenage or holiday trappers. In the forested foothills region several registered traplines exist.

The most abundant ungulate species in the lower valley is probably mule deer; while elk and moose dominate the upper basin. There may be as many as one moose per square kilometer and perhaps as many elk. All three of these are hunted regularly. Elk are common northwest and south of Highway 27 and are occasional marauders of farmer's haystacks. White tail deer appear to be increasing in number, possibly in response to increased tree removal.

Whereas there are only 30 known blue heron rookeries in all of Alberta, one of them exists on the Little Red Deer River near the Dogpound convluence. A fairly stable nesting population consisting of an estimated 45 - 50 nests exists. A fairly common game bird seen along the lower reaches of the basin is the pheasant. The 'drumming' of the ruffed grouse during their spring courting activity is heard along most of the valley.

Erosion along the banks of the river.

5 HABITATION AND RESOURCE USE

HABITATION AND RESOURCE USE

CULTURAL HISTORY

The cultural history of the Little Red can be considered in four periods, according to human occupancy: 1) the Indians who had adapted to their natural environment; 2) the exploration and fur trade era, when European involvement depended on an exploitation of the natural environment and its native residents; 3) the settlement era, when political units were established and agricultural land occupation progressed; 4) present day occupancy, expressed as an industrialized agricultural region.

The Indians 10,000 B.C. - 1880

The basin of the Little Red was inhabited by two tribes; the Blackfoot, whose principal area of settlement was along the western Alberta Plains region, and the Stony (Assiniboine) tribe who inhabited the foothills region. At the present time no permanent native Indian community exists anywhere in the Little Red Deer Basin. With their large reserve west of Calgary and a small population on a provisional reserve at Bighorn there is some use made of the foothill portion of the watershed for native hunting rights.

Exploration And The Fur Trade

No fur trading forts were ever established along the Little Red Deer River. Exploration of the area by European surveyors and explorers probably began with Anthony Henday during a trip in 1754 - 55. Fidler moved through this area between 1792 and 1800, followed by David Thompson around 1810 although it is uncertain if Thompson ever explored east and south from Rocky Mountain House. Between 1857 and 1860 Palliser almost certainly traversed the basin in the course of his expeditions. The nearest fur trading forts were located at Rocky Mountain House. In that vicinity both the Hudson's Bay Co. and the Northwest Co. operated forts. Muskrat, beaver, mink, mule deer and bison were all common in the lower part of the basin, while elk, and moose as well as black bear were more prevalent in the foothills, Infrequently grizzly bear were also known to range through the basin.

Exploration

The Settlement Era

Prior to 1754 the basin was unexplored and was settled by the native Indians. As the two fur trading companies extended their interests however, the interior, known as Rupert's Land, became more and more a focus of attention. As Canada became an independent nation in 1867, the interior became a large Northwest territory. In 1882 the Little Red Deer River basin area as well as much of present day Alberta became the District of Alberta and received its own administrator who was accountable to the Central Government in Ottawa. Following this the Federal land survey of Alberta began with the eastern part of the Little Red Deer basin being surveyed before 1890. Pioneer settlement began at this time,first of all by cattle and sheep operators but with the sodbusters arriving almost simultaneously. The railway from Calgary north to Red Deer was constructed in 1891 and did much to facilitate settlement. In 1905 all of Alberta became a province and the Little Red Deer basin became part of the provincial electoral districts of Innisfail and Rosebud. Between 1900 and 1910 the western part of the basin was surveyed and settlement followed.

Present Day Occupancy

Settlement of the Little Red was based on the Homestead Act and greatly stimulated by the federal government's provision of free transportation of all personal effects to the nearest railway siding. Since then the agricultural pattern of land use in the basin has persisted for nearly 80 years. Foreign born farmers and business persons have contributed greatly to the structure of the basin, the majority coming from the states of Minnesota, North and South Dakota, Oklahoma, Great Britain, the Scandinavian countries and other western European nations. The single major source of pioneer settlers was probably eastern Canada. Each culture brought with it certain knowledge and attitudes which blended together to establish a viable economic enterprise based on crops and cattle.

ARCHAEOLOGY

Existing information reveals that ancient cultures were present in the study area. Numerous sites have been recorded where trained archaeologists would like to research artifacts. Most of these relate to native Indian civilizations. These sites are mainly findings of such artifacts as arrow tips, teepee rings and other individual items which indicate activity or presence rather than demonstrating a habitation. Until at least some of these are researched in detail further comment cannot be made on them. The chief concern about these is that no development of any artifact site should occur prior to a thorough analysis being carried out. Once a site is excavated and analyzed a decision can be reached whether or not to protect it. Because the sites are so numerous and publication of them invites their plundering, no further revelations will be offered concerning them in this report. It is appropriate to state that no known location in the basin has a designated critical archaeological significance.

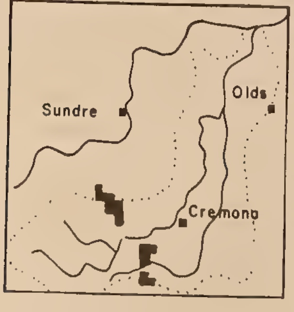
AGRICULTURE

Grain farming in this area has had various setbacks, initially because of slow maturing varieties of cereal crops and a fairly short frost free period but also from occasional hail storms. Forage crops and cattle have always been the mainstay of the agricultural economy and at the present time there are more acres of barley grown than all other crops combined.

Most of this barley is turned into cattle and hog food. Diversification in agriculture ensures an overall sustained income. Beef cattle production follows three main lines, these being commercial cow-calf, purebred, and feedlot enterprises. West of Water Valley traditional ranching is still the most dominant agricultural activity. Swine production and dairying are also common in the basin. The financial structure of farms varies greatly. This variation occurs between individual farm units rather than between different types of farm enterprises. The higher investment and income farms are increasing and have a greater effect on the general prosperity of the basin. The capability for Agriculture is shown on Map 2. (The past and present situation with regard to shoreland agricultural pursuits is discussed in Appendix A.)

TIMBER HARVESTING

Although the foothill portion of the basin is largely forested, lumbering is not a dominant industry even there. Some timber harvesting does occur to the northwest of Water Valley and also somewhat to the south and this timber is sawn into lumber and post products at a small mill at the Hamlet of Water Valley. In the period from 1971 to 1976, 22,054,518 board feet of timber were removed from these two harvest areas. The pine and spruce stands do have some potential to form part of the base for a pulp industry but this is not envisaged for the near future.



OIL AND GAS DEVELOPMENT

The Little Red Deer Basin has in the past 20 years, experienced the entrance and growth of the oil and gas industry.

The first producing well in the basin was drilled in the Harmattan Field in 1957 by Shell Canada. Since that time several hundred wells have been drilled, some producing gas, others oil, some salt water disposal wells and others are injection or water flood wells. Exploration and development of the industry is still proceeding in the headwaters of the basin.

This area is considered to be one of the most prolific gas producing areas in Alberta and still contains an estimated 2 1/2 billion cubic feet of natural gas as well as 90 million barrels of crude oil.[2] The oil companies have constructed and maintained several miles of road, three gas processing plants are placed in the basin and hundreds of miles of pipelines carry the gas and oil recovered from the wells. (See Map No. 6)

RECREATION

Although several facilities for recreational activities have been developed along the Little Red Deer River, it is not commonly regarded as a river with major recreation appeal. The most probable reason for this general lack of recreation appeal relates to the low water levels. Most reaches simply cannot be pleasantly paddled or boated, and those that can, have sufficient water for very short seasons, such as during spring snowmelt when the shoreland scenery lacks appeal.

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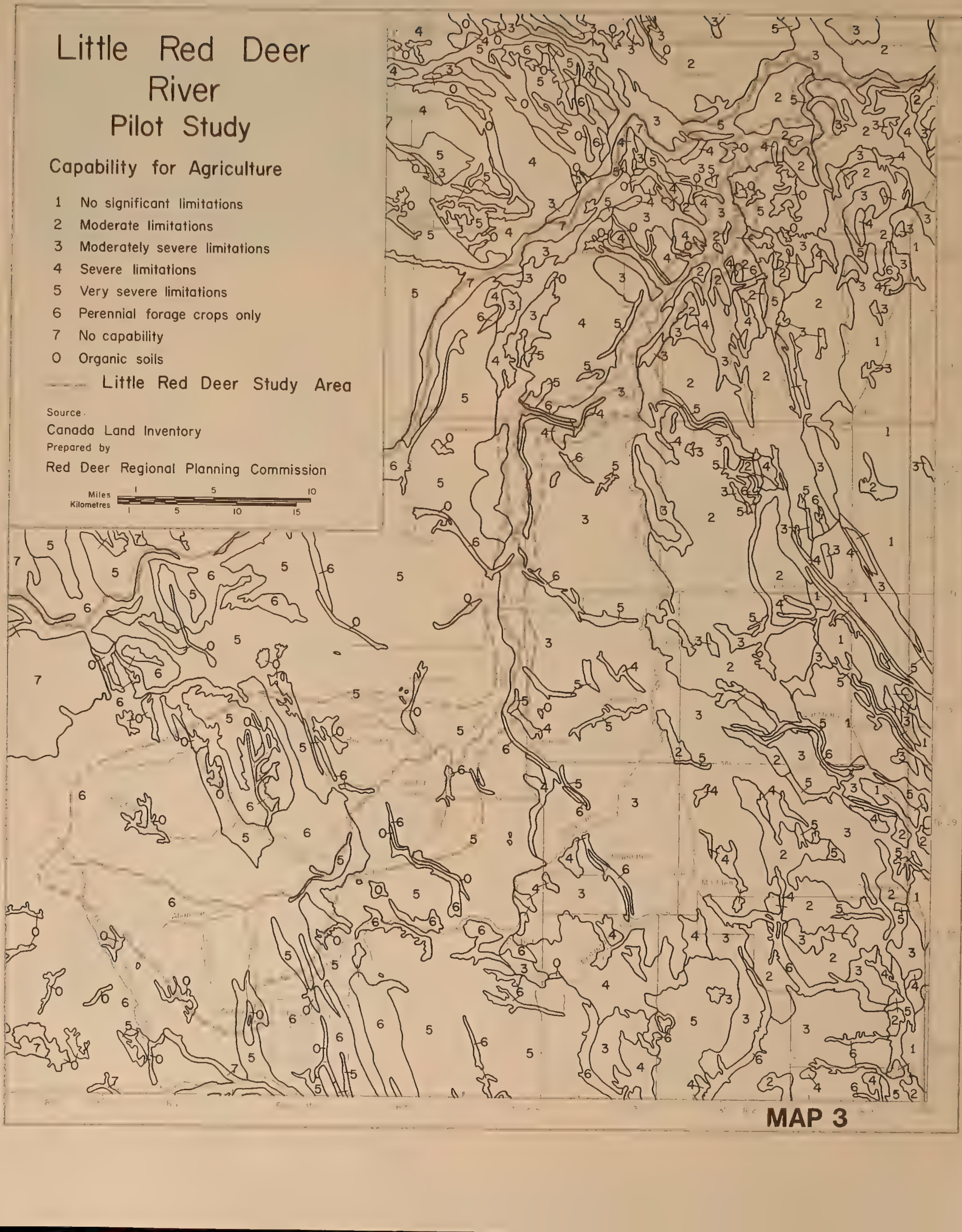
[2] Energy Resources Conservation Board: June 3, 1976



Little Red Deer River Pilot Study

Capability for Agriculture

1	No significant limitations
2	Moderate limitations
3	Moderately severe limitations
4	Severe limitations
5	Very severe limitations
6	Perennial forage crops only
7	No capability
0	Organic soils
- - -	Little Red Deer Study Area

Source:
Canada Land Inventory
Prepared by
Red Deer Regional Planning Commission

MAP 3

Still significant numbers of people travel to the Little Red Deer River for leisure time recreational activities. Most of these are short duration campers who use the municipal campgrounds or Red Lodge Provincial Park. Others are youth or family groups participating in church camps. Several of these exist on sites adjacent to the Little Red. What both of these developments have in common is access to and a view of a natural waterway, plus diverse and appealing landscapes and vegetation. Recreational camping is related, almost to the point of dependence, on a body of water, trees and landscape diversity. All occur along the Little Red and in some locations the combined quality of them presents a highly appealing atmosphere for relaxation or recreational camping.

Red Lodge Provincial Park can be considered one of the localized sites that has superior attributes, mainly because of the almost pure stand of large white spruce trees. Other camping areas also use similar natural values to advantage. In most instances however, campground developments exist where there is a combination of both natural amenities and accessible available land. Where high amenity sites are not available for development, sites having lower amenity values are developed as the only feasible alternative. The general result and present situation therefore is that some sites with considerable potential are kept from development while others with lower potential are developed. (See Map No. 4)

In addition to developed facilities for recreation there is constant recreational activity requiring no facilities along the Little Red. Hunting is a response to game populations and secluded valley side environments. Fishing occurs, in spite of the low degree of success, simply as a response to surroundings. And in the winter, snowmobiling dominates the list of activities although some cross-country skiing occurs. Both are responses to the secluded and largely scenic corridor that is provided along the river surface during the winter season.

Some of the more inviting pools in the river are used by local residents and their friends for swimming. This probably occurred more regularly in past decades when community swimming pools were less common but even now at least four areas are commonly used as wading ponds, these being at the North Water Valley campground, the Westward Ho campground, Red Lodge Provincial Park and at the Seventh Day Adventist camp.

Several residents readily stated that they or their families swim in the Little Red Deer River. In addition to swimming, it used to be quite common also for groups or families to clear the snow from the ice and skate there during the winter season. One location where this was done is just north of the bridge crossing the Little Red Deer River east of Bergen.

Whereas, all of these activities are pursued at the present time, still others would appear possible in the Little Red Deer Valley. Walking, hiking, cycling, riding and nature study could all occur here. Trails have not been developed but some reaches of the river are suited to them. Also, many more or larger recreation facilities could be required in the future.

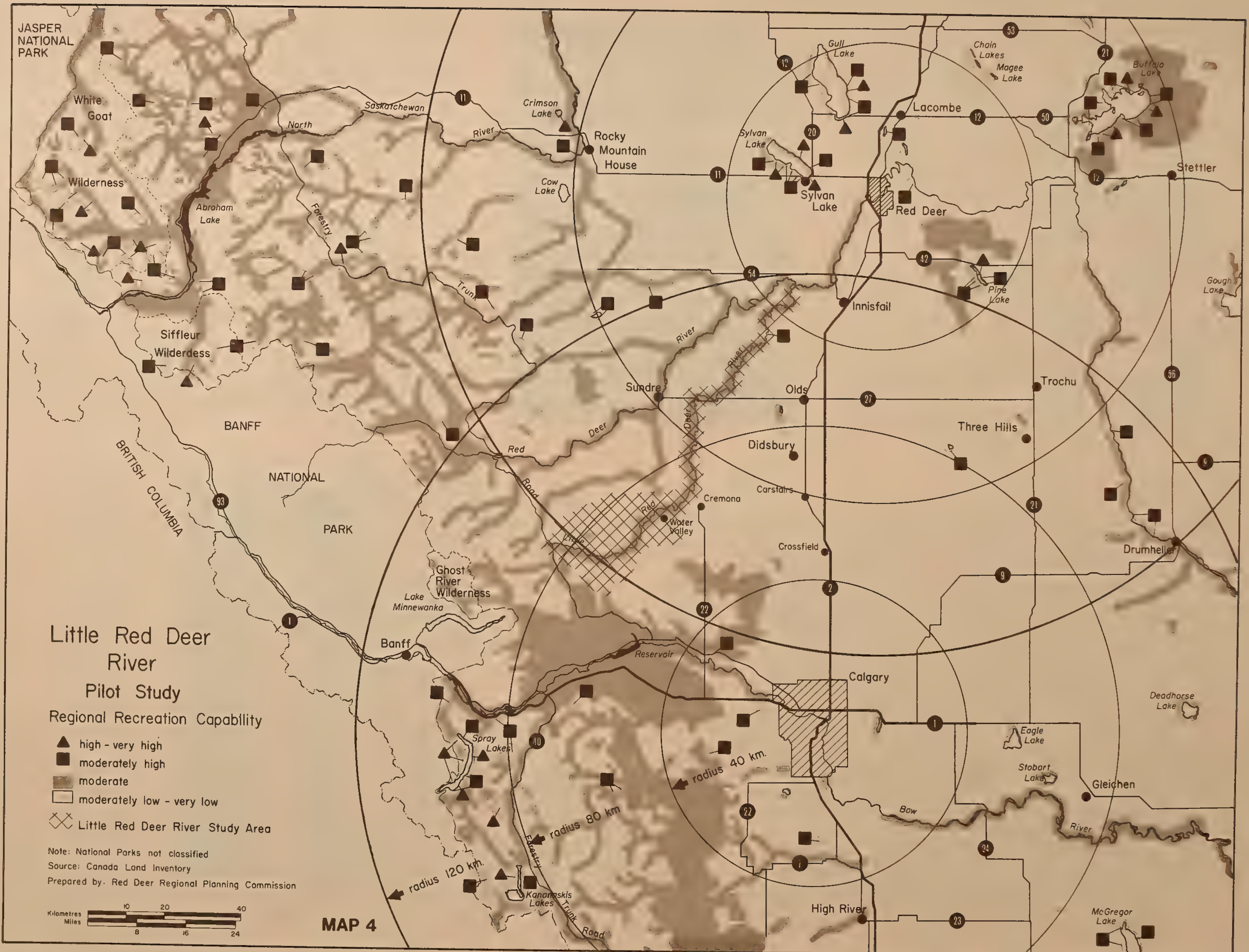
Swimming pool used by Seventh Day Adventist camp.

Public recreation in river valleys presents certain problems. First of all, camping occurs on public land and in most instances these facilities are available free of charge or at a token rate. Secondly, rivers are part of the public domain and are therefore available to the public without charge for such activities as do not impair the river. In most instances, outside the Green Area, land adjacent to rivers is privately owned and is not available for general public use, even to people who choose to recreate on the river. This is true not only for river shorelands, for private property adjacent to public recreation areas of any type is not available to the public for recreational activities.

Canoeing and Canoe Trails

Watercourses provide a particular attraction to the canoe paddler. Downriver paddling provides experiences that differ markedly from lake paddling or power boating, and these experiences mainly relate to the water conditions in the river channel itself. To briefly suggest some of these experiences, there is the refreshment and stimulation that comes from the physical exertion of paddling, the seclusion of confined valley landscapes, the reinforcing pull of the current and the diversity of changing water conditions as the stream bed varies from time to time.

Characteristics that affect the canoeability of a river should also be mentioned. Navigability is dependent upon depth and reliability of the water; velocity influences the challenge; rapids, rocks, waterfalls, and other obstacles establish the difficulty and risk, and frequency or difficulty of portages affect the diversity and toil associated with the experience. Other factors which have a bearing on canoeability and paddler satisfaction are length of navigable reach, accessibility, upstream paddleability and the number and quality of campsites available.



MAP 4

Little Red Deer River
Pilot Study
Regional Recreation Capability

- ▲ high - very high
- ■ moderately high
- ▨ moderate
- ☐ moderately low - very low
- ⨯ Little Red Deer River Study Area

Note: National Parks not classified
Source: Canada Land Inventory
Prepared by. Red Deer Regional Planning Commission

For all watercourses that are navigible, the ease of paddling must be further related to the skill category of the paddler. Therefore no simple paddleability index is used. Even where a systematic rating is attempted many runs require verbal discussion and also a description of conditions which occur at each season. Generally however, canoe courses are rated according to the degree of challenge involved and the amount of paddler satisfaction offered. Although various approaches could be applied to rate a stream's paddleability, and although the Little Red Deer lacks paddling variety, the system presented here for the Little Red Deer and for future application to any stream, is a modified version of the International Whitewater Rating[3] system prepared by the Appalachian Mountain Club. This system rated both rapids and reaches of the stream using a 0 - 6 scale where:

Class 0 implies insufficient water.

Class 1 means easy paddling.

Class 2 means moderately easy/difficult paddling.

Class 3 means difficult paddling (upper limit for open canoes).

Class 4 means very difficult paddling requiring advanced skills.

Class 5 means exceedlingly difficult, requiring expert paddling skills.

Class 6 means excessively dangerous for paddling.

The entire streamway can be studied and appropriately rated as to its paddleability. These ratings can then be used by paddlers and also may be incorporated into the plan itself for the Little Red Deer River.

Canoe Runs

Little can be said to demonstrate any suitability for canoeing or other forms of float recreation on the waters of the Little Red Deer River. There is not enough water during most of the summer season to float a boat above the rocks. During the spring snowmelt runoff some floating is possible but the absence of foliage at that season results in a stark landscape and a generally unsatisfying experience. Such a trip does provide frequent opportunities to view waterfowl and beaver and to hear the frequent drumming of ruffed grouse. Usually in June a rainstorm event also raises the river considerably. Although these may be of short duration, if well timed, a satisfying float experience may be enjoyed. These would generally be restricted to day trips since water levels may be too low the second morning unless rainfall continues. In this event, the weather conditions make the experience arduous.

Along many parts of the river there is insufficient water for canoeing.

Potential canoe runs exist along the river segments in Units A2 and A1; C4 to C1; G2 and G1; H3 to H1; I5 to I1 and M2 to J1.[4] Since a large amount of water is added by Dogpound Creek canoe runs downstream from its confluence are generally more reliable. In situations where the flow in the river reaches a magniture of 15 m^3/s (400 cfs) or greater instantaneous discharge there would be considerable potential for paddling most runs below Water Valley.[5]

Some reaches of the river can be canoed.

However, this magnitude of flow seldom occurs except during the two peaks mentioned and these are short in duration. In 1976 this condition lasted for three days in April and during that period the ice was flushed down the river creating some hazard for paddling and reducing the satisfaction sought. The six runs indicated are discussed below. These descriptions only apply when 15 m^3/s flow conditions exist. It is understood that flood conditions create hazards which should be avoided. The 15 m^3/s figure is well below flood stage.

UNIT A2 & A1

Easy launch at Bridge in center of Unit B1. Some navigational control required due to rock and gravel riffles. No white water or rapids but care is required for entry onto Red Deer River at the confluence. Scenery is pleasant due to entrenched valley and possible deer sitings. Class 2.

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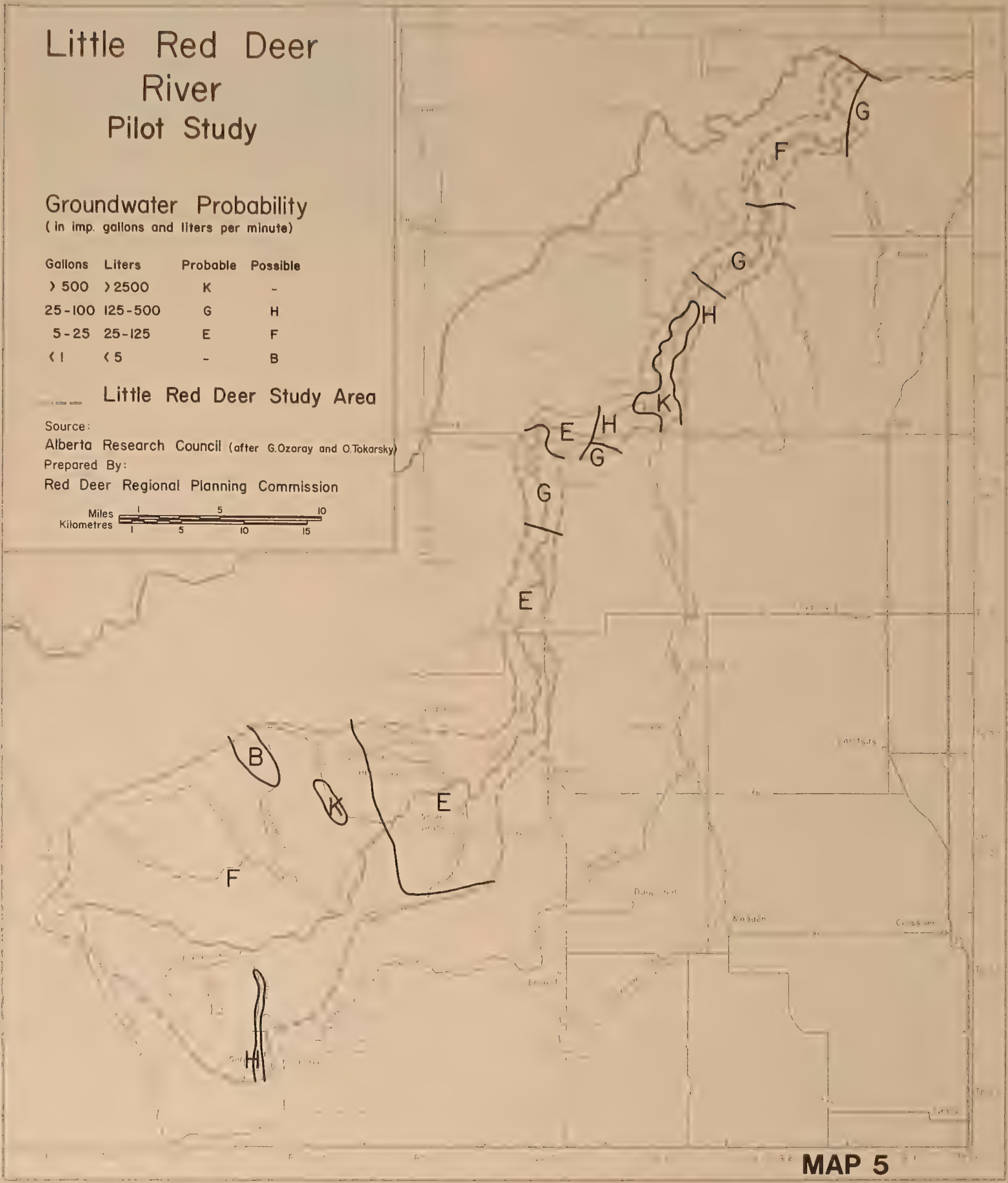
[3] Urban, J.T., A Whitewater Handbook for Canoe and Kayak Appalachian Mountain Club, Boston: 1974.

[4] The Units referred to here are discussed later in the report and are shown on Map 14.

[5] The International System of measurement guages streamflow in cubic meters per second. It is written as m^3/s.



Little Red Deer River Pilot Study

Groundwater Probability

(in imp. gallons and liters per minute)

Gallons	Liters	Probable	Possible
> 500	> 2500	K	-
25-100	125-500	G	H
5-25	25-125	E	F
< 1	< 5	-	B

Little Red Deer Study Area

Source:
Alberta Research Council (after G.Ozoray and O.Tokarsky)

Prepared By:
Red Deer Regional Planning Commission

MAP 5

UNIT C4 - C1

Easy launch at Red Deer Lodge Park or below bridge on Secondary Road 587. No rapids or ledges but possible gravel bars to navigate around. Some shallow bars to cross. Some attractive scenery midway and excellent primitive camping potential in meanders. Beaver, waterfowl and possibly other wildlife present. Class 2.

UNIT G2 & G1

Easy launch at bridge near Nazarene Church camp; moderately scenic, easy paddle, no difficult riffles or corners. Some waterfowl and deer may be viewed. Easy exit at bridge or near Dogpound Creek. Class 1.

UNIT H3 - H1

Most enjoyable run on Little Red. Easy launch at Highway 27 bridge and exit at Nazarene Camp bridge. Occasional rocky ledges and boulders in channel plus moderate rapids. Some sharp corners and fast water. Scenery is appealing throughout. Class 2.

UNIT I5 - I1

Mild water and scenery lacks distinction. Frequent cattle operations evident along banks but easy pull out sites. Some shallows to navigate through. Also evidence of frequent pipeline crossings, gas wells and powerline. Units J1 and J3 are least scenic but easiest to paddle. Class 1.

UNIT M2 - J1

Repetitious conditions of constantly meandering stream. Fairly pristine environment but frequent rock ledges and shallows can cause hangups. Considerable beaver activity possibly causing successful damming. May encounter fences across the water. Navigation is required to avoid rocks, bars, logs and beaver dams. No rapids or difficult water but two pumping sites where bulkheads across the river are a hazard. Class 1. (See note below).

RURAL RESIDENTIAL

Residential development along the Little Red Deer River has taken three forms. The traditional and well established farm dwelling or farmstead is the most common. It is not uncommon for farmsteads to be placed in a scenic shoreland or valley overview location. In this manner the amenities of scenery and the availability of water enhance the rural location. Several shoreland farmsteads are undesirably close to the streamway itself and are therefore potential causes of stream contamination, particularly when cattle are confined on the site. Other shoreland farmsteads are in some degree of risk as a result of erosion of the river banks.

A pleasingly developed cottage lot.

Only one major country residential subdivision occurs in this study area. This is the Hamlet of Westward Ho which has 16 lots. The Hamlet is set back a short distance from the river bank, and is developed along a traditional grid layout. Several other separate lots have been subdivided and developed alongside of the river. These are shown on Map 7. In recognizing a concern for the essential values presented by river valleys and the rural character of the countryside generally, country residential development is not a high priority use for these areas. However, some locations do have amenities and physical characteristics which not only appeal to the country resident, but are tolerant to that form of use.

Recreational Cottaging has proceeded to a greater extent than either of the previous residential forms. Similar amenities of the natural landscape attract cottagers and country residents, although the country resident tends to prefer a somewhat larger lot that will provide a semblance of agricultural activity together with the esthetic amenities of rural living. In excess of eighty cottage lots have been subdivided along the Little Red and most of these are now developed. These are located in grouped subdivisions at Silver Lagoon, which is just north of Red Lodge Provincial Park (8 - 35 - 2 - 5), and at Water Valley where the Little Red Estates (33 - 29 - 5 - 5) and the Bancroft Subdivision (20 - 29 - 5 - 5) are located. Although the more common form of development is the cluster, several individual cottage subdivisions exist.

The Water Valley area, which is within convenient driving range from Calgary along Highway 22, and with its rich natural endowment of trees and deep valley sides, is a natural focus for increased pressure for further cottage subdivision. There is evidence at most of the cottage subdivisions that inadequate attention is

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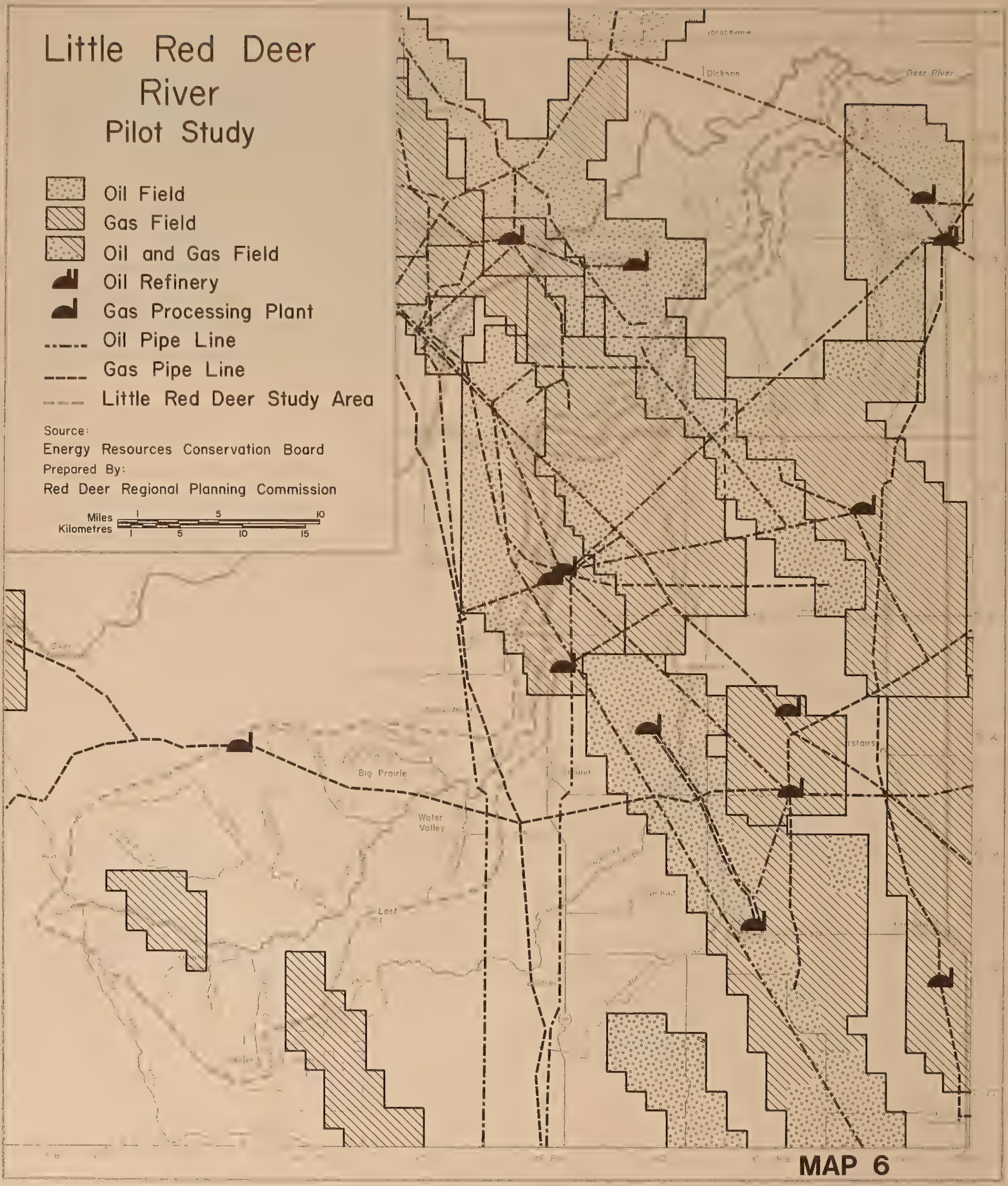
Note:

Hooper developed a detailed shoreland typology, vegetation and streamway inventory and mapping methodology which he has effectively applied to mountain rivers to describe their suitability for canoeing and kayaking. That technique was found too detailed for the shorelands and the streamway lacked sufficient diversity to warrant using it for this interdisciplinary study.


Little Red Deer River
Pilot Study
Oil Field
Gas Field
Oil and Gas Field
Oil Refinery
Gas Processing Plant
Oil Pipe Line
Gas Pipe Line
Little Red Deer Study Area
Source:
Energy Resources Conservation Board
Prepared By:
Red Deer Regional Planning Commission
Miles
Kilometres
1
5
10
1
5
10
15
Spruceview
Dickson
Deer River
Big Prairie
Water Valley
Lost
rstairs

MAP 6

given to protecting natural amenities. Architectural standards need to be upgraded also and time frames for development should be narrowed. In the case of all residential subdivisions along shorelands there must be a firm guarantee that the process of development will not downgrade the characteristics of the shoreland which attracted the development.

This isolated cottage is in a hazardous, indiscrete location. Notice the river in the lower right.

WATER DEMAND

Land owners adjacent to the Little Red Deer River are entitled to use the water in the river for such purposes as livestock watering and domestic use without securing a licence for such privileges. These are their rights as riparian owners. However, all forms of extraction of river water for other purposes require a water rights licence. These are issued through Alberta Environment. At the present time water is removed for waterflood well injection, minor irrigation works, and industrial water supply.

Before any water licences are granted a study is made of the stream's hydrology to determine what volume of water removal may be licenced. When permission is authorized there are generally requirements to adjust withdrawals according to the flow so that more can be pumped during high flow periods. When granted, the amounts permitted to be withdrawn are established relative to the streamflow records, the amount already committed and the requirements of downstream users. Instream effects on fish, water quality and flow characteristics are also considered. Priority in licencing is given to the first applicant and in turn preferential water rights are granted to the first approved applicant when there is an insufficient amount of water for all licencees. Those licencees requiring a constant supply of water are required to construct a reservoir either on the stream or offstream so that during low flow periods their water demands can be met from the reservoir rather than from the base flow of the river. Shell Canada uses this approach with a steel bulkhead in the channel and an offstream reservoir. Bailey Selburn Oil placed a concrete slab bulkhead across the river and pumps to its Crossfield Cardium gas field.

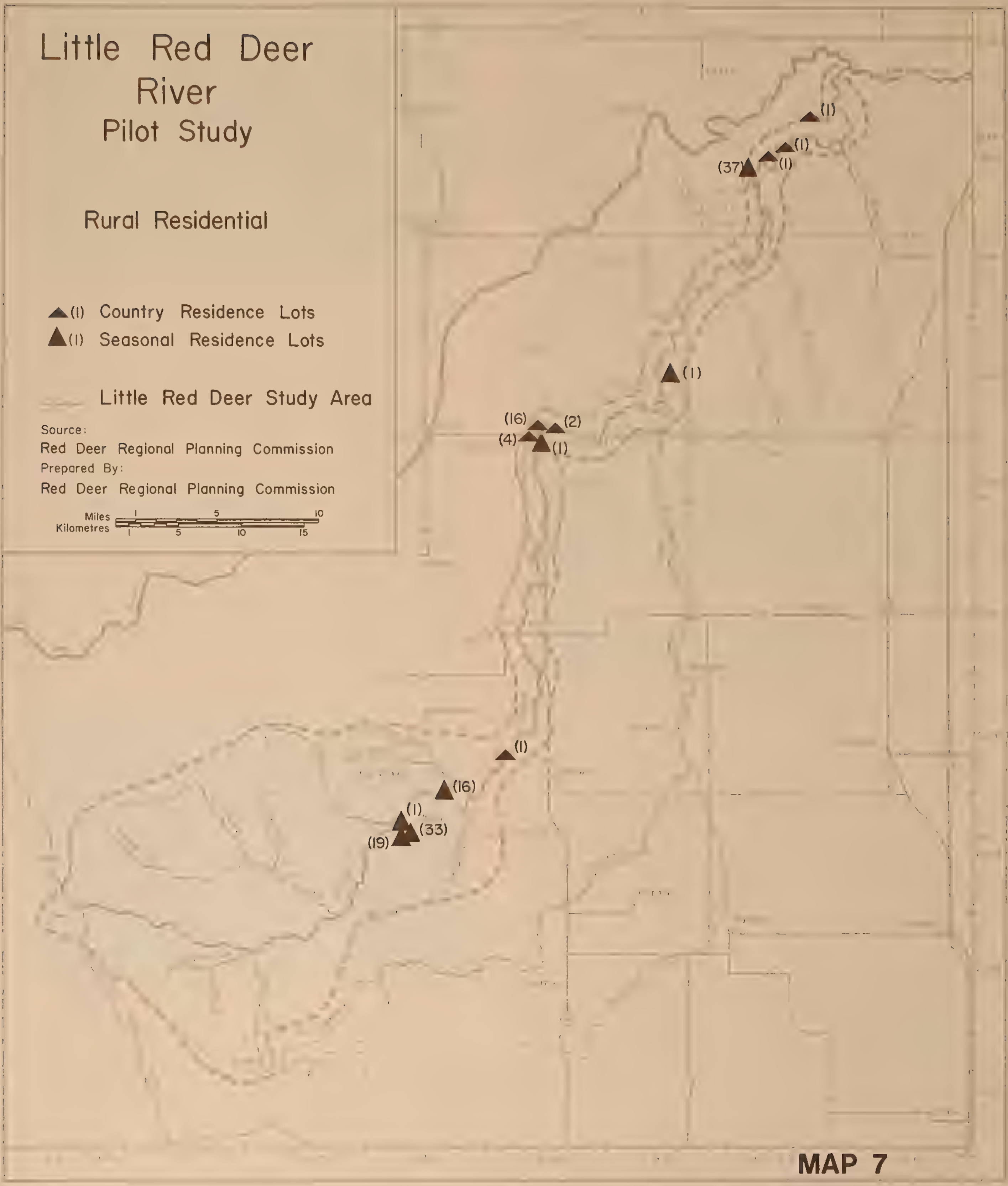
Bailey Selburn bulkhead and pumping house.

Although each licenced water user is subject to inspection at any time, such inspections rarely occur more than once every ten years. Instead, the user is required to file an annual report which accounts for the operation. However, where an inspection reveals any improper condition the licence may be revoked. No metering of water is required of the licensee and so the withdrawals are largely left to the integrity of users. Because of the preferential water rights of users who were first licenced this system is seemingly acceptable.

All licenced water users on the Little Red Deer River are listed on Table C.

This total of 4243 cubic decameters pumped from the river each year when related to the annual mean flow of the river (151,011 dam^3) is not considered to be overly significant. In the case of the largest user, Shell Canada, an offstream reservoir is used and so much of the pumping from the river occurs during the high flow period.

In addition to licenced withdrawals directly from the Little Red Deer River there are several domestic reservoirs across tributary channels. These provide for stock watering. They withhold small volumes of water from the river but since those streams flow only during snowmelt or following heavy rains, their effect on the flow of the Little Red is imperceptible.



Little Red Deer River
Pilot Study

Rural Residential

▲(1) Country Residence Lots
▲(1) Seasonal Residence Lots
Little Red Deer Study Area
Miles 1 5 10
Kilometres 1 5 10 15
(1)
(1)
(37)
(1)
(1)
(16)
(2)
(4)
(1)
(1)
(16)
(1)
(33)
(19)

Source:
Red Deer Regional Planning Commission
Prepared By:
Red Deer Regional Planning Commission

MAP 7

TABLE C

Water Licences

Name	Purpose	Annual Quantity[6]		Location
Bailey Selburn Oil (Crossfield Cardium Field)	Injection	345 dam^3	280 Ac. Ft.	NE 33-30-4-5
Canadian Superior Oil	Processing	123 dam^3	100 Ac. Ft.	SE 28-31-4-5
Shell Canada	Injection	3160 dam^3	2558 Ac. Ft.	SW 28-31-4-5
French Petroleum	Injection	30 dam^3	25 Ac. Ft.	SE 21-33-3-5
Pennzoil	Injection	37 dam^3	30 Ac. Ft.	SE 21-33-3-5
Hudson's Bay Oil & Gas	Injection	493 dam^3	400 Ac. Ft.	NE 4-33-4-5
R. F. Mountain	Irrigation	55 dam^3	45 Ac. Ft.	NE 13-33-2-5
	Total Licenced:	4243 dam^3	3438 Ac. Ft.	

WATER QUALITY

Both the Provincial Department of the Environment and Water Survey of Canada technicians collected water samples from the Little Red Deer River and analyzed the quality. Most samples were collected at the guaging station west of Innisfail. Few conclusive deductions can be drawn from these samples because of the brevity of the sampling but some general findings are available.

Oxygen levels were found to be within the guidelines used by Alberta Environment. Throughout the sampling period (summer months only) this quality was maintained. Oxygen in the water is essential for all forms of aquatic life. Except for the month of May, Ph values were acceptable. Nitrogen, in the form of nitrate, nitrite and ammonia was below maximum permitted except in May. Since ammonia oxidizes to form nitrate and nitrite it consumes oxygen from the river. Any overload would be detrimental to aquatic life. Both nitrate and nitrite in high concentrations are toxic to livestock and in particular, human infants.

For a meaningful analysis of water quality there must be a systematic and intensive sampling of the water at several representative sites over a reasonable time frame. No such survey was done on the Little Red Deer River and so the findings from the token survey identify indicators of problems rather than clearly defining them. However, the survey did demonstrate that the water in the Little Red Deer is below the quality of that in the Raven River and somewhat superior to that of the Medicine at the time when samples were taken.

Water quality studies that were reported in the Red Deer River flow Regulation Study bulletins state that the Little Red Deer contributes to the problems of quality in the Red Deer River. The probable sources of this problem are discussed below.

Municipal Sewage:

Treated sewage from Cremona, Olds and Bowden is discharged into the Little Red Deer River. This occurs in Spring or Fall. Latest discharge is usually in September. At present the effluent treatment standards are related to the dilution capability of the receiving waters rather than to the maintenance of baseline water quality as it exists before the effluent is discharged. The appropriateness of this regulation is not being debated here. Insofar as treatment facilities are concerned, both Bowden and Olds upgraded their sewage handling facilities in 1977. Unless standards are revised these systems should be adequate to the mid 1990's. Cremona has recently upgraded its treatment facility to meet existing standards for the next fifteen years although maintenance is required to ensure effective functioning. Beyond the awareness that municipal effluent is discharged into the Little Red Deer River, no adequate data exist to demonstrate the extent of impact this effluent has. It is known however that the impact is confined to the high water flow period as much as possible. At the same time recent experience demonstrates that when the lagoons are being drained into tributary streamways the concentrations of effluent in these streams have been so high that livestock refuse to consume the water. Although water levels in the rivers into which this sewage flows are high at the time there will certainly be some degree of contamination from this practice. The tributary creeks are particularly affected.

Since the Little Red Deer River does not contain adequate water for year round sewage dilution, the Department of the Environment requires either secondary treatment or else seven months storage in lagoons preceded by a primary anaerobic - aerobic pond sustem. Where the receiving watercourse is almost dry for most of the year secondary treatment must precede a seven month lagoon storage or else a twelve month lagoon storage preceded by the anaerobic-aerobic pond system.

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6. The International System of water volume measurement uses cubic decameters. One decameter is 10 meters long. The abbreviation for decameter is dam. Decameter is pronounced dek-a-meter as opposed to desimeter (des-y-meter) which is 1/10 of a meter.

Summer flow is sometimes very low.

Although the purpose of treatment of wastewater is to maintain the quality of water in the streams, the effects of this sewage on the receiving waters is unknown. Unfortunately, some municipalities feel they can simply transport the problem downstream.

At the present time, we have the technology to treat our wastewater and prevent pollution, although proper treatment is costly. In some situations domestic wastes may be composted so they can be replaced as fertilizers. Another alternative is to apply sewage directly from treatment lagoons to agricultural land as a form of irrigation.

Agriculture's Contribution

Animal wastes, silt, and the nitrogen and phosphorus derived from fertilizers are the principal contaminants generated from agricultural operations. Animal wastes have a much higher toxicity than do human wastes per cubic meter and their volume per animal is very high. The chief problems associated with animal wastes in waterways relate to their biological oxygen demand (BOD), chemical oxygen demand, suspended solids, nitrates and odor. In spite of the known undesirable effects of these wastes when they enter streams, no specific site has been identified as having a definite problem. However, it is well understood that many problems exist because of operational oversights or practices in the cattle business. Chief among these problems is the proximity of cattle to watercourses. Intensive livestock confinement at locations adjacent to the river or even on its tributary channels results in a direct input of barnyard manure into the river. Excusing this practice with the argument that significant runoff from the feedlot only occurs during the spring melt (high flow) period does not alter the reality of these conditions, nor does it offset the problem that occurs during summer rains. Significant problems also exist as a result of livestock watering in the river, grazing its banks and trampling its bed.

Feedlots are sometimes placed directly on the river banks.

Cattle walking into the river causes water contamination.

The practice of winter feeding of livestock on the river flats or on the ice and watering through the ice causes a direct introduction of raw manure (untreated sewage) to the watercourse.

Clearing and cultivation of land close to stream banks accelerates soil erosion and thereby increases the sediment load in the river. Since soil is the vital component for crop growth, the best preventive posture lies with the land owner. Practices which retain the vital soil enhance his earning potential.

Nitrogen and phosphorus are supplied to streams from both animal wastes and chemical fertilizers. The route to the stream may be overland accompanying runoff or it may be through soil moisture and groundwater recharge and subsurface flow. It can only be avoided by preventing excessive amounts from accumulating in the soil or on land which drains freely to a watercourse. Although specific examples of agricultural pollution cannot be identified along the Little Red Deer River, the realization that agricultural operations blanket the entire basin presents reason to suspect the cumulative effects they must generate.

It would be a disservice to the majority of farm operators however, not to express their strongly voiced desire to maintain a good quality watercourse. At the same time it must be recognized that their financial wellbeing has and continues to be based on intensified management of those lands which they have title to whether or not the river is nearby.

Campgrounds

Along the Little Red Deer River, there are three public camping areas. No flush toilets or pump out tanks are used at any of these campgrounds, but dry-pit toilets are used. These have not been known to cause problems other than odor and in most instances, when located well back from stream courses should not contaminate the water. Some criticisms have been voiced concerning the pit toilets at Westward Ho and North Water Valley. Problems of water flood during high river levels apparently occur and this may indicate outflow of wastes to the river. A further problem associated with the dry-pit toilets is their offensive odor. During periods of heavy use this situation can become intolerable unless they are carefully and regularly cleaned and treated chemically. Otherwise the facility tends to be abandoned in preference for the open air.

Westward Ho Campground

Church Camps

Each of the church camps along the Little Red Deer River is a potential source of water pollution. Plumbing installations at each camp are evaluated independently and must meet the requirements of provincial legislation. Several departments are involved in regulating plumbing and health factors but their intent is to prevent contamination of drinking water, watercourses and lakes. Pit toilets are not included in these regulations but the Public Health inspector can require that they be so located as to prevent problems of contamination. All plumbing and health aspects of church camps are usually checked by the inspector two or three times each summer.

The type of sewage system used by any camp is at the discretion of the camp itself. Whatever system is used must meet standards established in legislation. The Seventh Day Adventist camp uses all built-in plumbing and a primary treatment lagoon to handle sewage. The lagoon is drained into the Little Red Deer River during spring flow and again in fall since the lagoon has a six month retention cycle. The Nazarene Camp, which also uses flush toilets disposes of sewage through a septic tank and field. Until 1976 the Evangelical United Brethren Church camp used pit toilets but has since installed a septic tank and field system. Camp Valaqua, operated by the Mennonite Conference of Alberta also uses the septic tank and field system. Camp Canaqua, which is a United Church camp uses dry pit toilets and have no plans for upgrading. Although concerns have been expressed about the large numbers of people in attendance at these camps on some occasions and the resultant sewage, there is no evidence of contamination in the Little Red Deer River resulting from their sewage.

Nazarene Church Camp

Whereas each of the camps is located to take advantage of the river and its valley environment, any deterioration of these elements would be undesirable for them. Some of the camps use the pools in the river for swimming. Almost without exception, personal communication with the camp managers has shown a concern for the reduced quality that has been detected in the river water and a desire to see the adjacent valley retained in a largely natural state.

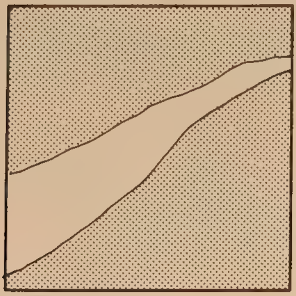
CHURCH CAMPS

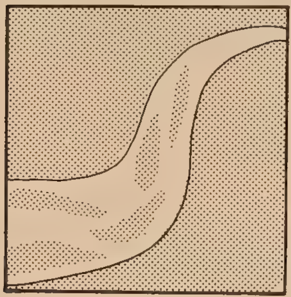
Denomination	Location
United Church	SW 29-29-5-5
Mennonite Conference	SW 2-30-5-5
Evangelical United Brethren	NE 17-31-4-5
Nazarene Church	SE 1-33-4-5
Seventh Day Adventist Church	SE 1-34-3-5

6 APPROACH AND EVALUATION METHODOLOGY

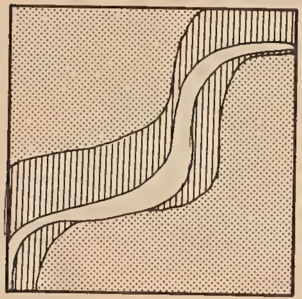
APPROACH AND EVALUATION - METHODOLOGY

RIVER SYSTEMS IN PERSPECTIVE


Fixed Pattern


Braided Pattern

A river system is the final impression of the hydrologic cycle. It is also a highly visible expression of the continuity of nature's processes. Distilled from the sea by the sun, water is stored as vapour in clouds and subsequent precipitation over the earth's surface allows it to enter the river regime. Thereafter, as it flows along the downtrending inclines of the earth's surface it acts as the principal sculpturing agent of the landscape. As a river, it transports minerals, sediments and nutrients from upland to lowland, sometimes mixing with stagnant water, and eventually pouring into salt water estuaries. In its flow, it enriches life along its channel and reshapes its banks, thereby leaving its own pattern on the earth. And while the pattern of each river system is unique and results from numerous influential factors, portions of any river exhibit similarities with portions of other rivers. While there are transitions from one river pattern to the next along a channel, certain distinct 'patterns' are recognized. These patterns are listed below:


Entrenched Pattern

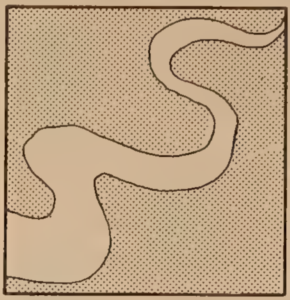
FIXED PATTERN: fairly steep gradient; course boulders strewn in river bed; turbulent water.

BRAIDED PATTERN: Many channels which successively meet and re-divide around small unstable bars and gravel island; moderately steep gradient.

ENTRENCHED PATTERN: bed is cut deep into bedrock; moderately steep gradient; single channel; course boulder-strewn river bed.

MEANDERING PATTERN: moderate to low gradient and sinuous, symmetrical curvature.

POOL AND RIFFLE: repetition of shallow but steepened riffles followed by deeper, quieter pools; usually considered a sub-pattern evident in previous patterns.


Meandering Pattern

The Little Red Deer River most clearly demonstrates the meandering pattern but frequent transition types are evident together with short and somewhat immature entrenched reaches. Although most fluvial geomorphologists contend that all channel patterns fall into four major categories (fixed, braided, meandering, and branched), for this Study it was decided that an expansion was desirable. As a result the meander pattern has been expanded to include pastoral, broad valleys and entrenched valleys. Other rivers may include an anastamosing pattern and also a branched pattern.

ESSENTIAL FUNCTION AND GOALS FOR A RIVER

The ultimate function of natural resource planning along river shorelands is to develop a schedule for management which provides the optimum benefits from the shoreland resources, allows land owners greatest satisfaction and flexibility in exercising their ambitions, and ensures the healthy functioning of the river and its river dependent phenomena so that benefits may be available from them, both to downstream and horizontally separated users of them. Ancillary goals related to this function are listed below. These apply to the river as a total system.

1. To conserve the watershed so as to provide a reliable supply of clean water for aquatic habitat and downstream users.
2. To guide development so that the greatest overall benefits may be realized from the plan rather than to maximize benefits from each individual area.
3. To encourage the continued use of arable soils for agricultural purposes within such constraints as maintain good water quality and stable soil.
4. To provide a vehicle that encourages the wise management and use of unique features of the streamway and shorelands of the river.
5. To satisfy the multiple needs or aspirations of resident and non-resident users.

SPECIFIC SHORELAND PLANNING TARGETS

While carrying out studies of rivers certain concerns are surfaced and problems are seen which should be addressed in the course of the study. Part of the orientation of the study should be to document these concerns and problems and much of the balance of the study should be to seek ways of reducing the concerns and eliminating the problems. The study must either bring about the resolution of these things or directions capable of resolving them. The level of resolution desired in each instance is a specific planning target. By hitting these specific targets all of the more general goals will be achieved. The targets are presented below grouped into categories. Some may appear to be in conflict, but this is because they are presented independently, without any attempt to resolve overlapping foci. This resolution must be provided through the plan.

Water Resource Targets:

a. Provide adequate water quality for local and downstream domestic needs.

b. Maintain and enhance the habitats of fish and water oriented wildlife.

c. Restrict activities which contaminate water or render it unesthetic.

d. Prevent shorelands from damages caused by water induced erosion.

e. Meet reasonable industrial water needs.

f. Prevent or minimize risks and damages from flooding.

g. Facilitate the use of river water and shorelands for the recreational benefits they can supply.

h. Maintain water yield as the prime function for the Eastern Slopes.

i. Increase the level of stream monitoring and data gathering pertinent to water quality, and habitat condition.

j. Provide appropriate accommodation for the water requirements of agricultural operations along and adjacent to the river.

Conservation Targets:

1. Maintain or enhance the near natural state and function of stream related natural water and shoreland characteristics.
2. Restrict all impacts to intensities which may be tolerated by the resiliency of the river system.
3. Maintain a perennial refuge for indigent wildlife along the river's margins and shield or improve the quality of the sport fishery in the stream.
4. Preserve unique, primitive and fragile features of the riverscape.
5. Prevent incompatible development of the river corridor.
6. Stimulate action to restore abused areas and to restore the overall integrity of the riverscape.

Recreation Targets:

1. Maintain the scenic integrity of the river.
2. Enhance opportunities for public recreation.
3. Promote resource based recreation in preference to facility based activities in river shoreland areas.
4. Accommodate a variety of good quality recreation opportunities consistent with type and intensity of demand.
5. Prevent recreational uses or developments from causing unacceptable damage to the river or its shorelands.
6. Restrict recreational activity so that neither the recreational experience or the rural experience of present residents is impaired by it.
7. Minimize the negative impacts of non-recreational uses on recreational amenities, facilities, and experiences.
8. Preserve or retain for future recreational use, lands with superior characteristics favourable for recreation.

Agriculture Targets:

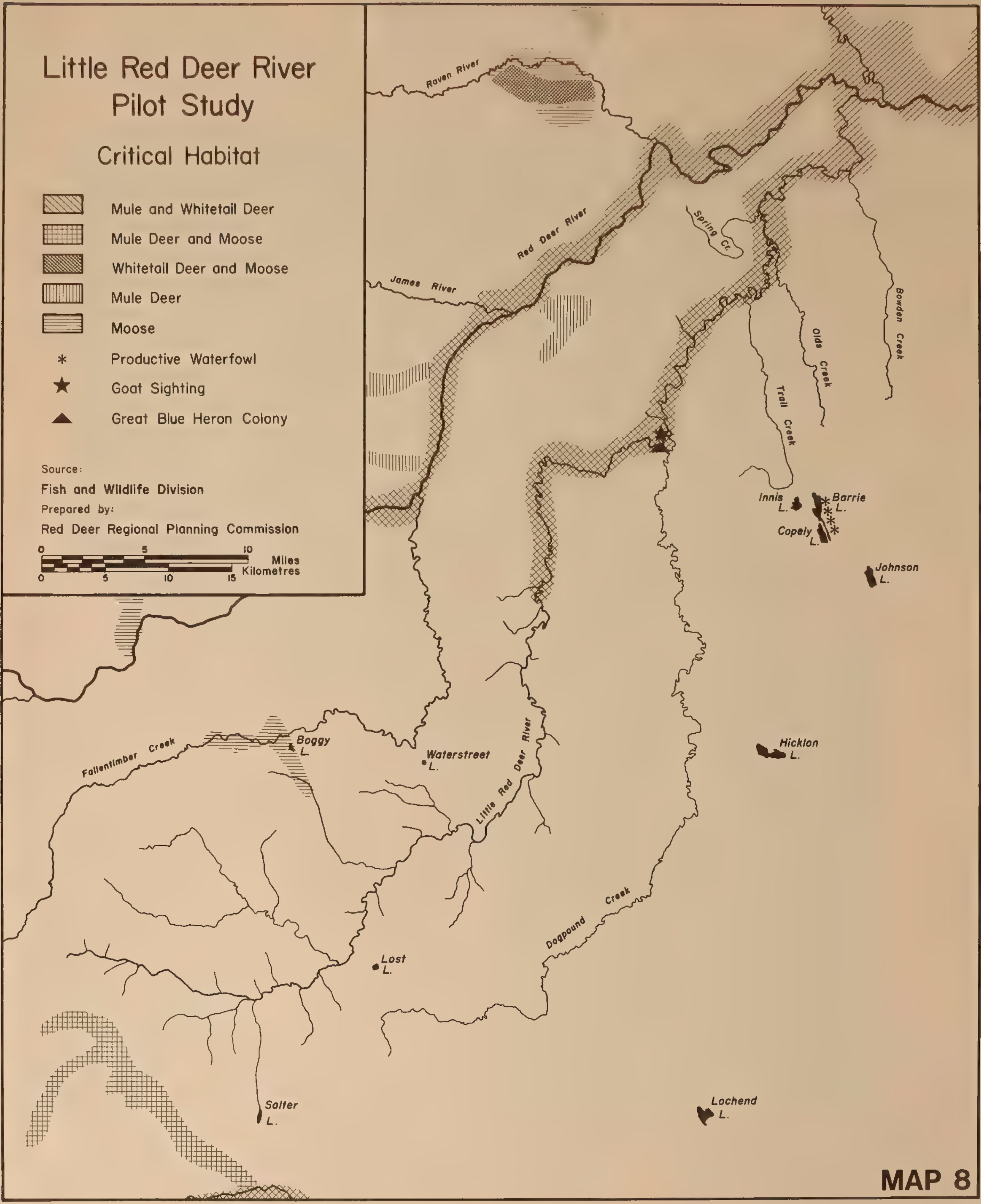
1. Maintain the life style of farm operators living on or near river shorelands.
2. Minimize adverse effects of alternative uses on the agricultural economy along the river.
3. Protect the water in or entering the river from contamination from agricultural uses.
4. Promote a progressive scaling down of those agricultural practices that have excessive impacts on shorelands which are vital to the integrity of the stream and its shoreland processes.
5. Restrict non-agricultural uses from occupying and consuming land which has good food producing capability.
6. Identify means of compensating present land owners who are inconvenienced by changes in their operational requirements and suggest incentives to stimulate action aimed at reducing negative impacts on the river system.

Land Ownership Targets:

1. Retain existing private titles to shorelands where it is evident that desired conditions can be realized through regulations.
2. Identify areas where public aquisition is the most appropriate means of providing opportunities for public use, and preservation of vital qualities.
3. Emphasize the existence of a public domain corridor along watercourses and clarify its boundaries.

Access Targets:

1. Permit road development to approved development areas.
2. Use existing roadways as a factor for locating new development.
3. Accommodate all access needs using standards which provide convenience, safety and appropriate levels of satisfaction to the users.



Little Red Deer River Pilot Study

Critical Habitat

Source:
Fish and Wildlife Division
Prepared by:
Red Deer Regional Planning Commission

MAP 8

MAP 9 LANDSCAPE UNITS

LITTLE RED DEER RIVER

SCALE 1:50,000
1 cm = 0.5 km (500 m)
1¼ inches = 1 mile approximately

PREPARED BY R.D.R.P.C. 1978

LEGEND

Mapping Convention

Surficial Material	Texture
Slope	Soil Group
Surface Expression	Soil Moisture

SURFICIAL MATERIAL

A	recent alluvial materials sands and gravels
Ac	glacial - alluvial materials sands and gravels
Tg	till glacial deposits
O	organic material
W	water body

SLOPE

1	flat
2	< 2% slope level to gently undulating
3	2-5% slope, undulating
4	5-9% slope or gently rolling
5	9-15% slope or moderately rolling
6	15-30% slope or rolling
7	30-60% slope or hilly
8	> 60% slope or very hilly

1 and 2 are mapped as 1.

SURFACE EXPRESSION

a - apron
b - blanket
d - subdued
e - eroded
f - floodplain
fa - fan
g - gullied
h - hummocky
i - inclined
l - level
p - pitted
m - rolling
r - ridged
s - steep
t - terraced
u - undulating
v - veneer

Photo Interpretation by Ptarmigan Aerial Surveys, with Soils Mapping assisted by A. Kjearsgaard, Agriculture Canada.

MAP	**9a**	Silver Lagoon to Red Deer River
MAP	**9b**	Eagle Hill to Silver Lagoon
MAP	**9c**	Harmattan to Eagle Hill
MAP	**9d**	Elkton to Harmattan
MAP	**9e**	Little Red Estates to Elkton
MAP	**9f**	Forest Reserve to Little Red Estates

TEXTURE

F	fine clay-sandy clay
M	medium - silty clay loam silt
C	coarse - sandy loam and sand
VC	very coarse - stones and gravel

SOIL GROUP

C	chernozem
L	luvisol
R	regosol
G	gleysol
O	organic
DL	disturbed land

SOIL PREFIXES

b	black
d	dark
g	grey
h	humic
y	gleyed

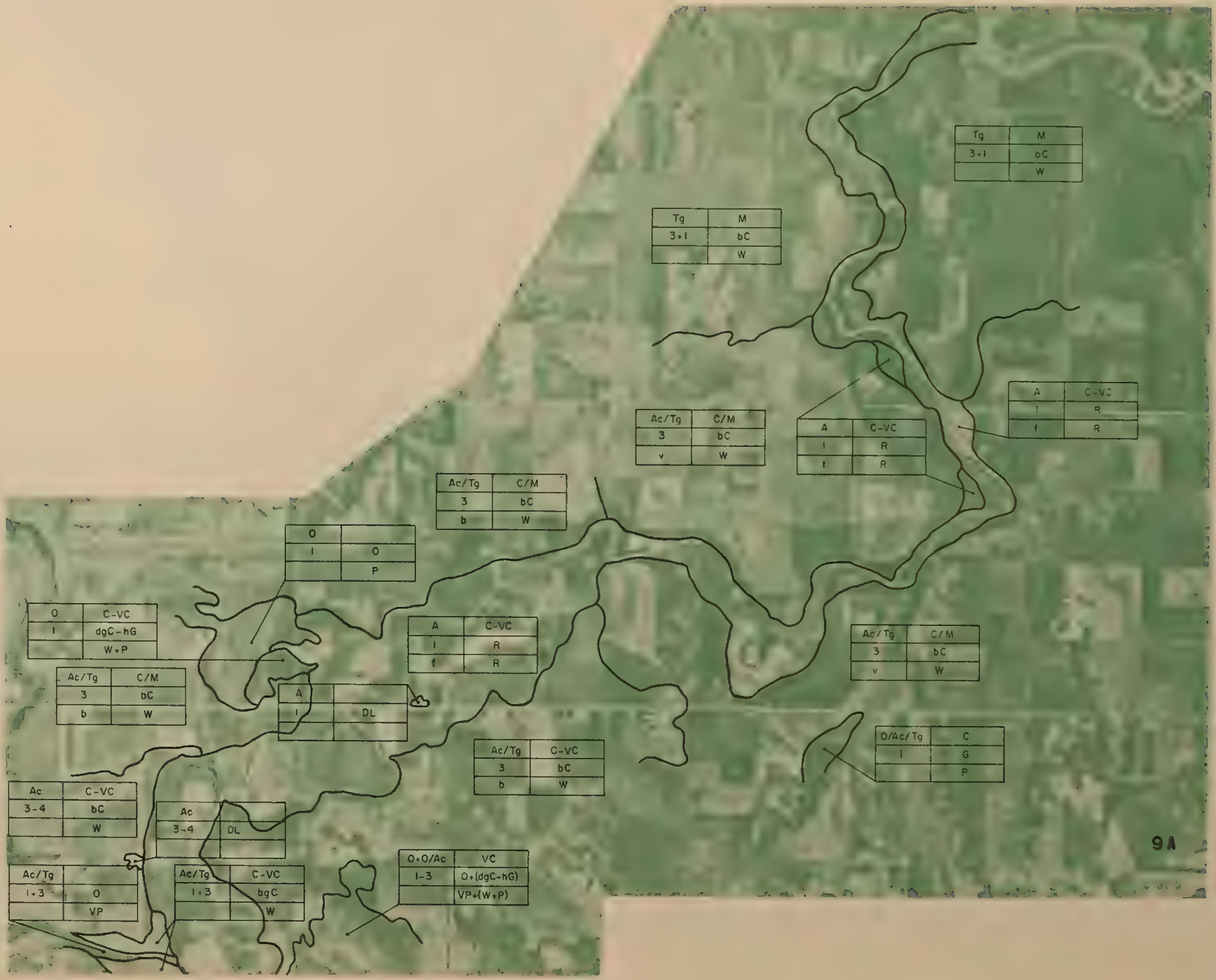
SOIL MOISTURE

R	rapidly drained
W	well drained
MW	moderately well drained
I	imperfectly drained
P	poorly drained
VP	very poorly drained

Elaboration of Mapping Conventions

single character = 60 to 80% of unit dominated by that rating.

- two characters separated by - means first character occupies 60% of unit and from 25% to 40% of second rating is present.
- two characters separated by a + means the second rating occupies 10-25% of the unit.
- two characters separated by a / means the first overlays the second.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Tg 3+1 M bC W
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A 1 f C-VC R R
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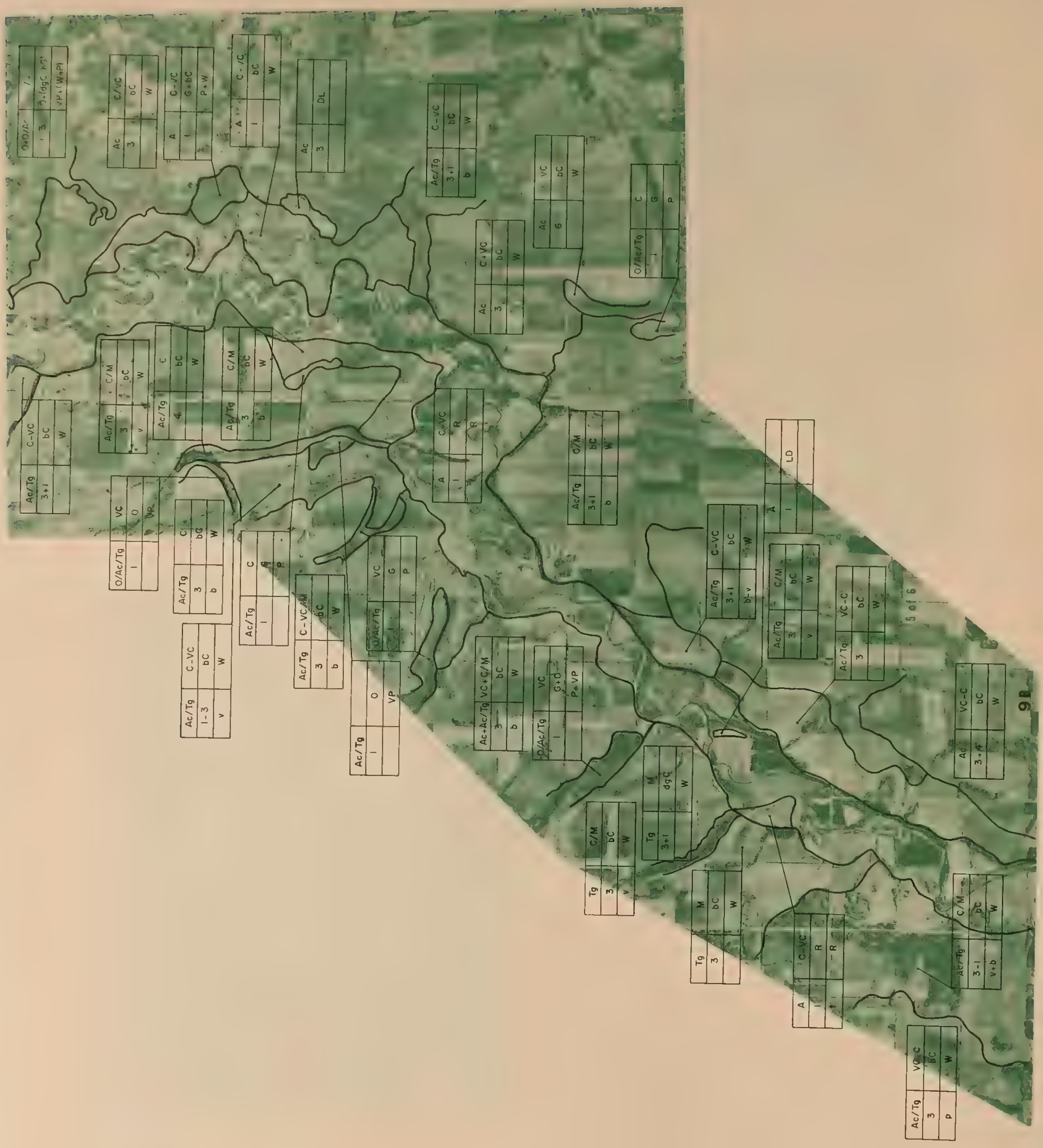
O 1 O P
O 1 C-VC dgC-hG W+P
A 1 f C-VC R R
Ac/Tg 3 v C/M bC W
Ac/Tg 3 b C/M bC W
A 1 DL
O/Ac/Tg 1 C G P
Ac/Tg 3 b C-VC bC W
Ac 3-4 C-VC bC W
Ac 3-4 DL
O+O/Ac 1-3 VC O+(dgC-hG) VP+(W+P)
Ac/Tg 1+3 O VP
Ac/Tg 1+3 C-VC bgC W
9A


O+O/Ar 3 /. 3+(dgC hG) VP+(W+P)
Ac 3 C/VC bC W
A 1 C-VC G+bC P+W
A 1 C-/C bC W
Ac 3 DL
Ac/Tg 3+1 b C-VC bC W
Ac 6 VC bC W
O/Ac/Tg 1 C G P
Ac 3 C+VC bC W
Ac/Tg 3+1 C-VC bC W
Ac/Tg 3 v C/M bC W
Ac/Tg 4 C bC W
Ac/Tg 3 b C/M bC W
A 1 C-VC R R
Ac/Tg 3+1 b C/M bC W
A 1 LD
O/Ac/Tg 1 VC O VP
Ac/Tg 3 b C bG W
Ac/Tg 1 C P
Ac/Tg 3 b C-VC/M bC W
O/Ac/Tg 1 VC G P
Ac/Tg 1-3 v C-VC bC W
Ac/Tg 1 O VP
Ac+Ac/Tg 3 b VC+C/M bC W
O/Ac/Tg 1 VC G+O P+VP
Ac/Tg 3+1 b-v C-VC bC W
Ac/Tg 3 v C/M bC W
Ac/Tg 3 VC-C bC W
Ac 3+4 VC-C bC W
Tg 3+1 M dgC W
Tg 3 v C/M bC W
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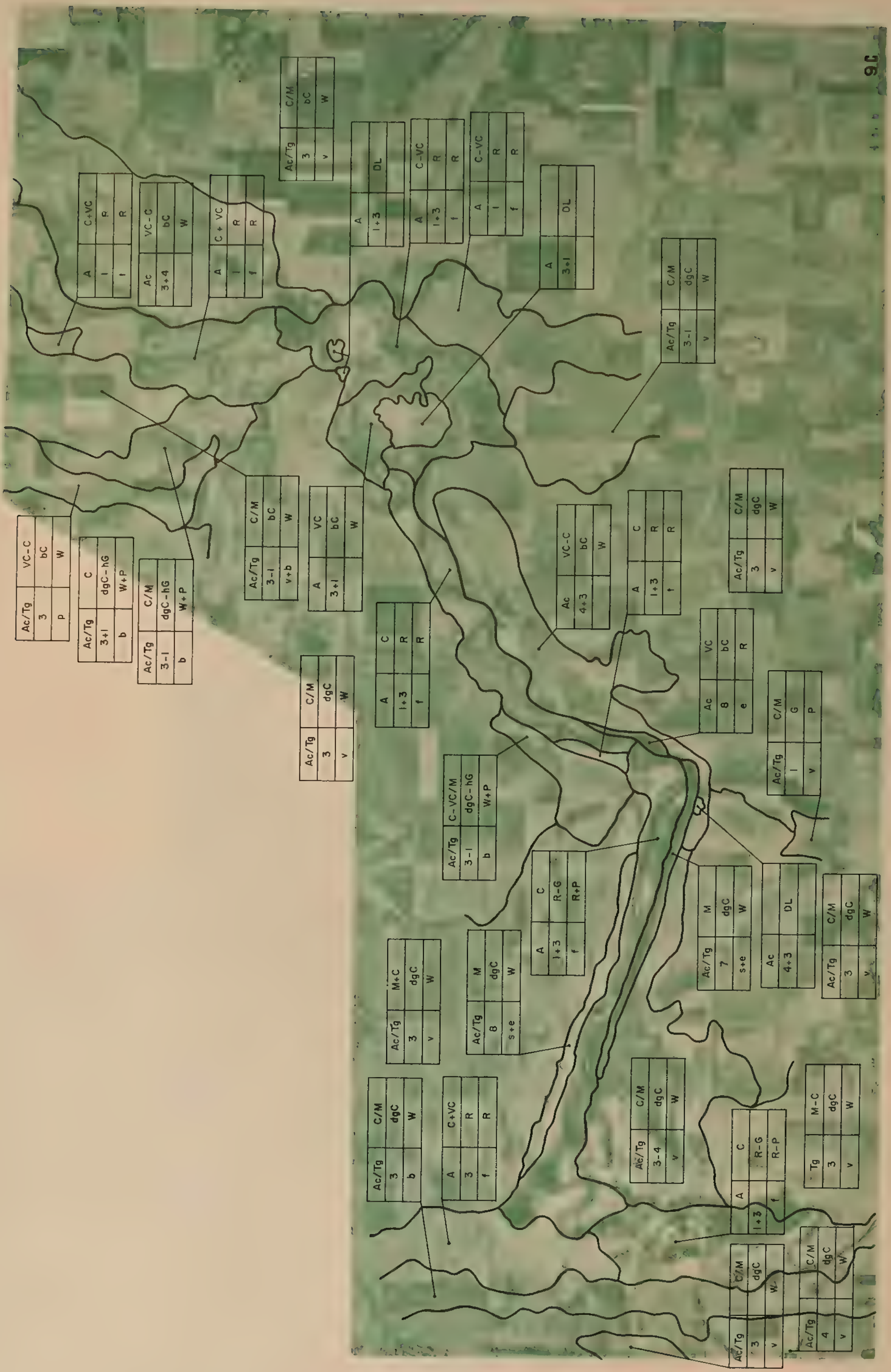
Ac/Tg 3 P VC-C bC W
5 of 6
9B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Ac VC-C 3+4 bC W
A C+VC 1 R f R
Ac/Tg C/M 3 bC v W
A DL 1+3
A C-VC 1+3 R f R
A C-VC 1 R f R
A DL 3+1
Ac/Tg C/M 3-1 dgC v W
Ac/Tg C/M 3-1 bC v+b W
A VC 3+1 bC W
Ac/Tg C/M 3 dgC v W
A C 1+3 R f R
Ac VC-C 4+3 bC W
A C 1+3 R f R
Ac/Tg C/M 3 dgC v W
Ac VC B bC e R
Ac/Tg C/M 1 G v P
Ac/Tg C-VC/M 3-1 dgC-hG b W+P
A C 1+3 R-G f R+P
Ac/Tg M 7 dgC s+e W
Ac DL 4+3
Ac/Tg C/M 3 dgC v W
Ac/Tg M+C 3 dgC v W
Ac/Tg M 8 dgC s+e W
Ac/Tg C/M 3 dgC b W
A C+VC 3 R f R
Ac/Tg C/M 3-4 dgC v W
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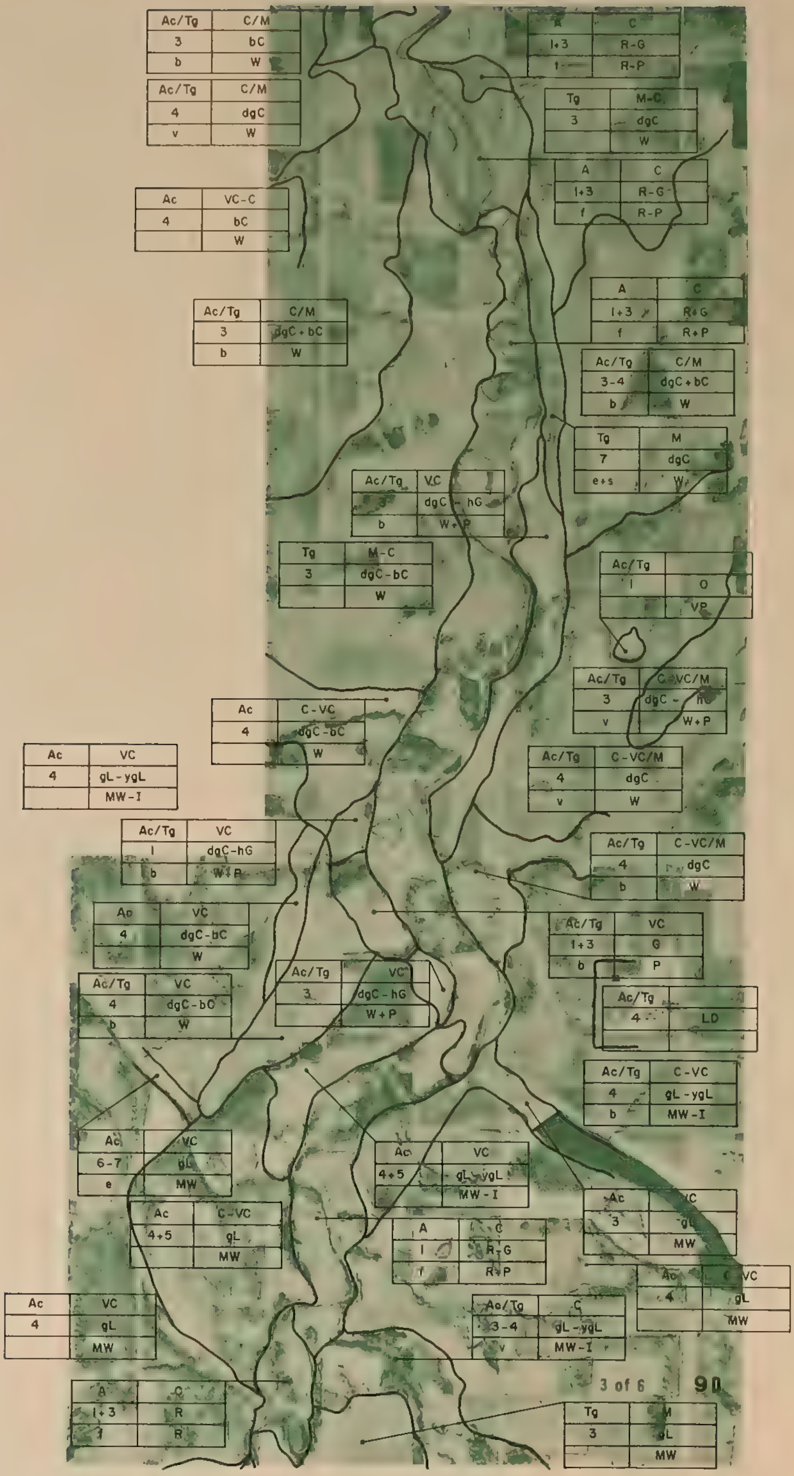
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A C 1+3 R-G f R-P
A C 1+3 R+G f R+P
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Tg M 7 dgC e+s W
Ac/Tg VC 3 dgC-hG b W+P
Tg M-C 3 dgC-bC W
Ac/Tg 1 O VP
Ac/Tg C-VC/M 3 dgC-hG v W+P
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Ac VC 4 gL-ygL MW-I
Ac/Tg C-VC/M 4 dgC v W
Ac/Tg VC 1 dgC-hG b W+P
Ac/Tg C-VC/M 4 dgC b W
Ac VC 4 dgC-bC W
Ac/Tg VC 1+3 G b P
Ac/Tg VC 4 dgC-bC b W
Ac/Tg VC 3 dgC-hG W+P
Ac/Tg 4 LD
Ac/Tg C-VC 4 gL-ygL b MW-I
Ac VC 6-7 gL e MW
Ac VC 4+5 gL-ygL MW-I
Ac VC 3 gL MW
Ac C-VC 4+5 gL MW
A C 1 R-G f R+P
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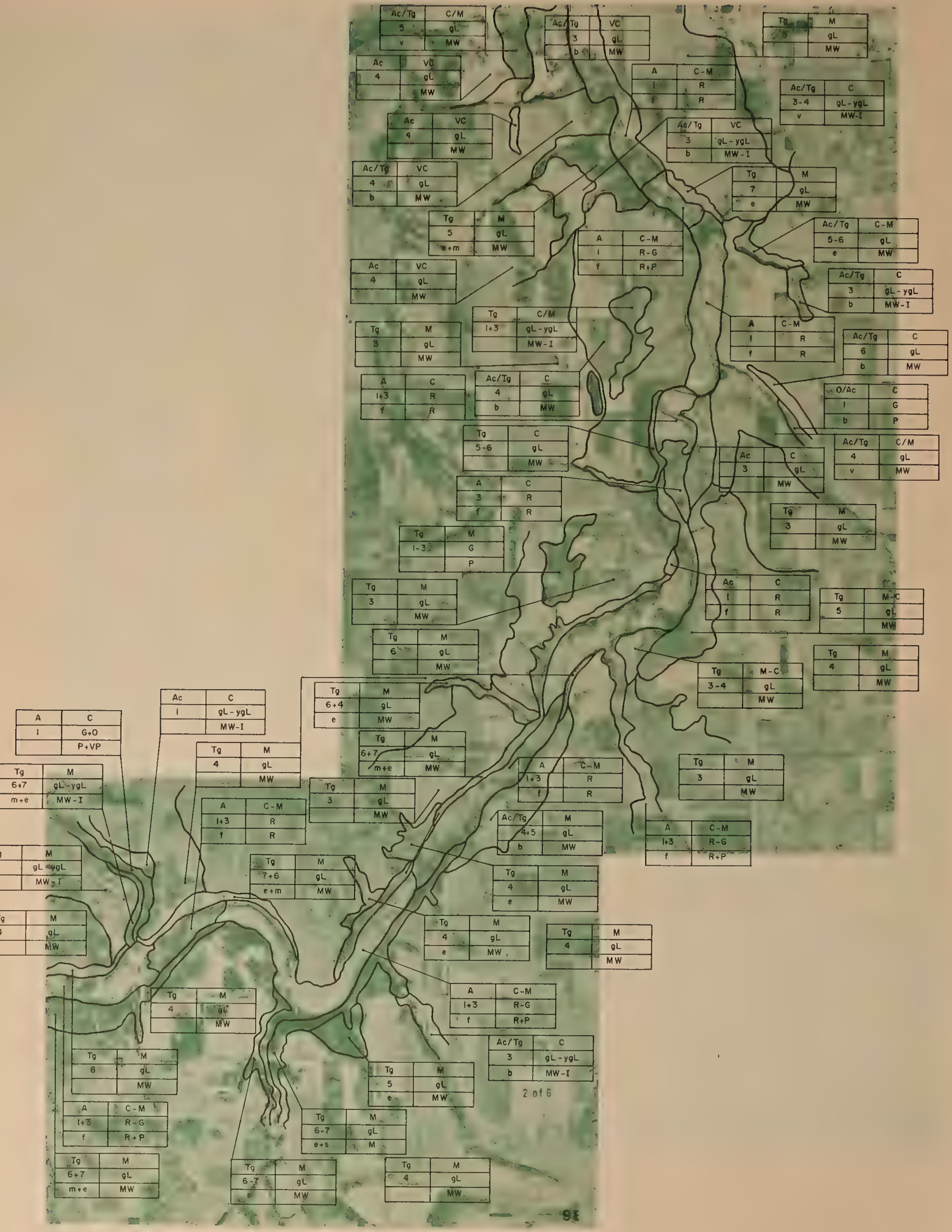
Ac VC 4 gL MW
Ac/Tg C 3-4 gL-ygL v MW-I
3 of 6
A C 1+3 R f R
Tg M 3 gL MW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Ac VC 4 gL MW
Ac/Tg VC 3 gL-ygL b MW-I
Ac/Tg VC 4 gL b MW
Tg M 7 gL e MW
Tg M 5 gL e+m MW
A C-M I R-G f R+P
Ac/Tg C-M 5-6 gL e MW
Ac VC 4 gL MW
Ac/Tg C 3 gL-ygL b MW-I
Tg C/M I+3 gL-ygL MW-I
Tg M 3 gL MW
A C-M I R f R
Ac/Tg C 6 gL b MW
A C I+3 R f R
Ac/Tg C 4 gL b MW
O/Ac C I G b P
Tg C 5-6 gL MW
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Tg M 3 gL MW
Ac C I R f R
Tg M-C 5 gL MW
Tg M 6 gL MW
Tg M 4 gL MW
Tg M-C 3-4 gL MW
A C I G+O P+VP
Ac C I gL-ygL MW-I
Tg M 6+4 gL e MW
Tg M 4 gL MW
Tg M 6+7 gL-ygL m+e MW-I
Tg M 6+7 gL m+e MW
Tg M 3 gL MW
A C-M I+3 R f R
Tg M 3 gL MW
A C-M I+3 R f R
Ac/Tg M 4+5 gL b MW
A C-M I+3 R-G f R+P
M gL-ygL MW-I
Tg M 7+6 gL e+m MW
Tg M 4 gL e MW
M gL MW
Tg M 4 gL e MW
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2 of 6
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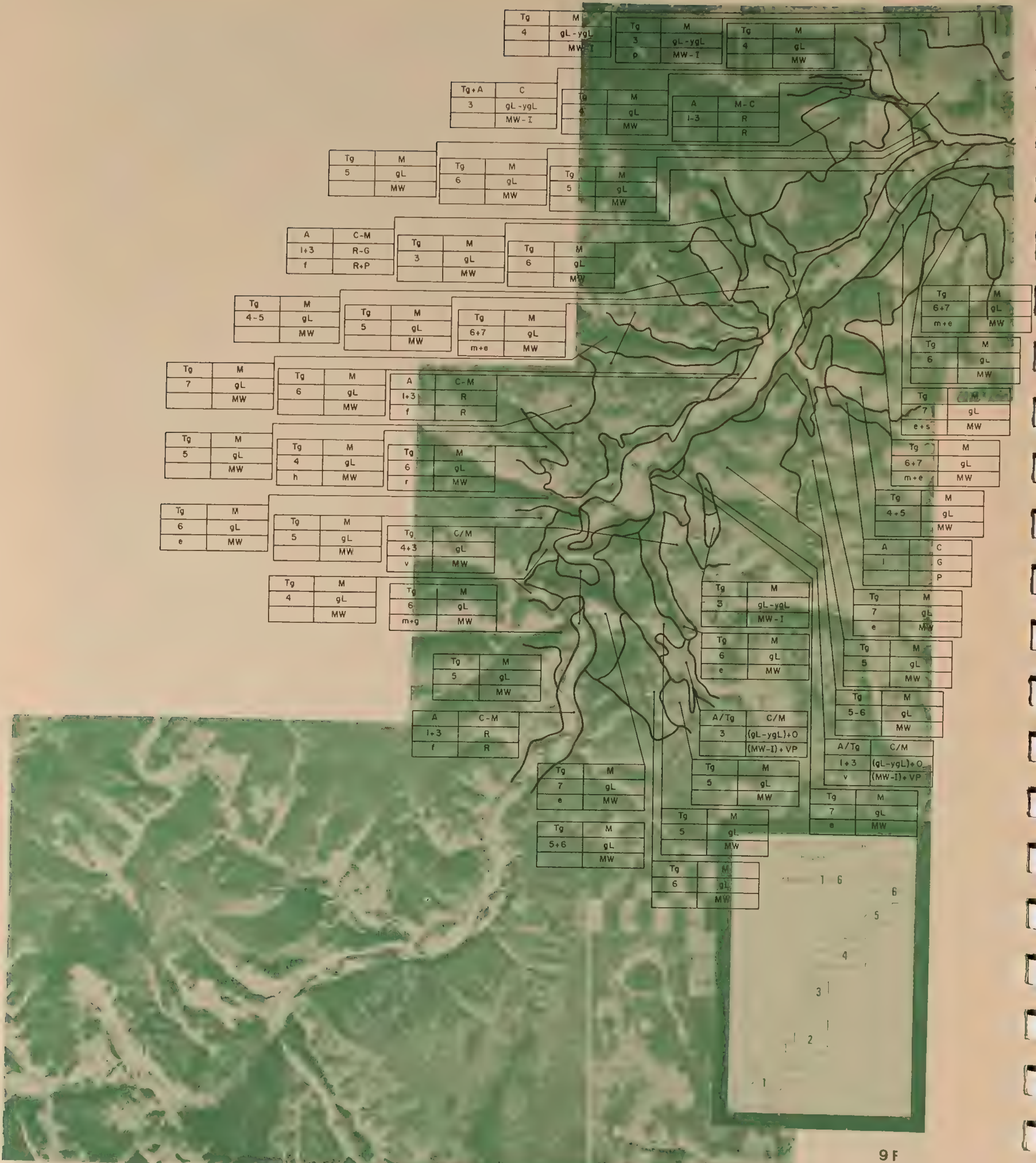
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Tg M 6+7 gL m+e MW
Tg M 6 gL MW
Tg M 7 gL MW
Tg M 6 gL MW
A C-M 1+3 R f R
Tg M 7 gL e+s MW
Tg M 5 gL MW
Tg M 4 gL h MW
Tg M 6 gL r MW
Tg M 6+7 gL m+e MW
Tg M 4+5 gL MW
Tg M 6 gL e MW
Tg M 5 gL MW
Tg C/M 4+3 gL v MW
A C 1 G P
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Tg M 6 gL m+g MW
Tg M 3 gL-ygL MW-I
Tg M 7 gL e MW
Tg M 6 gL e MW
Tg M 5 gL MW
Tg M 5 gL MW
Tg M 5-6 gL MW
A C-M 1+3 R f R
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A/Tg C/M 1+3 (gL-ygL)+O v (MW-I)+VP
Tg M 7 gL e MW
Tg M 5 gL MW
Tg M 7 gL e MW
Tg M 5 gL MW
Tg M 5+6 gL MW
Tg M 6 gL MW
1
6
6
5
4
3
2
1

9F

4. Recognize the natural character of river valleys and avoid unnecessary encroachments onto or across it by roadways.

Regulation and Control Targets:

1. Develop a consistent strategy for land and water management along the entire river.
2. Identify practical land use options for each area.
3. Achieve support and acceptance by the relevant municipal authorities of the Study program and its recommendations.
4. Achieve endorsement of the study and its recommendations by residents and property owners situated along the river.
5. Implement the findings of the study through relevant legislation and bylaws.

PRELIMINARY RESOURCE DATA COLLECTION

The Little Red Deer River Pilot Study began with preliminary collection and mapping of resource data, with the goal of gathering as much data as possible. Using various mapping scales, depending on the sources available, the following information was compiled for the lands adjacent to the river.

File	Source
Capability for Agriculture	Canada Land Inventory
Capability for Recreation	Canada Land Inventory
Critical Wildlife Habitat	Fish and Wildlife Division
Groundwater Probability	Alberta Research
Oil and Gas Resources	Energy Resources Conservation Board
Rural Residences	Red Deer Regional Planning Commission
Land Ownership	County and I.D. Records
Archaeology	Heritage Resources
Hydrology	Water Survey of Canada
Water Quality	Environment Canada and Alberta Environment
Access	Red Deer Regional Planning Commission
Present Zoning	County By-laws
Recreation Facilities	County offices and Provincial Parks
Shoreline character	Field checking and air photos
Soils	A. Kjearsgaard of Agriculture Canada and Ptarmigan Aerial Surveys[7]
Present Land Use Vegetation Topography and Slope Surficial Material Erosion Hazard Soil Drainage	Prepared by D. Luff and R. Shelford of Ptarmigan Aerial Surveys - Edmonton, Alberta [7]

This information was compiled and in most cases, mapped so that it would be readily available for continued analysis of the valley, as well as for future planning and design work. Without these essential data, the Study could not have taken on such a comprehensive nature, nor would the level of detail recorded for each unit have been possible to achieve.

DEVELOPMENT OF THE APPROACH

The natural processes which are inherent in a river basin need to be understood and wisely managed if the high quality natural environment along the river is to be maintained and acceptably used. A river valley with its stream channel and water is a matchless resource from several standpoints and so we must consider how to best manage its inherent qualities. The approach to arrive at this goal is to evaluate the extent that the natural resource base of the river expresses itself at each location. Therefore, the river valley and its systems must be broken down into parts, for which the characteristics and qualities can be recorded and evaluated. Such an evaluation allows use assignments to be tied directly to locations where the potential for each use is greatest. In addition to the highest quality locations, the potential for use at any location will depend on how strongly the natural resource is expressed at that location.

THE APPROACH

The approach developed for this Study is organized around five key propositions. Each proposition serves as an objective in the development of the analysis technique.[8]

1. Rivers are Water Systems Composed of a Regular and Predictable Set of Features.

A river is a natural, inter-related and complete system within which continuous river processes and drainage regimes operate, not delimited or confined by artificial boundaries.

In identifying the total scope of the area that contributes to conditions and experiences within the river system, the total riverscape is included. The riverscape is that area of land and water wheron activity and influences will produce a response in the functioning of the river and its dependent systems. This generally includes all of the valley and extensive portions of the watershed.

Within this riverscape corridor are certain predictable or regularly occurring features. The floodplain, for instance is that portion of the riverscape that is susceptible to inundation by the river at least every 50 - 100 years. Due to its significance to human activity and well-being, and since investments focussed on the floodplain could be lost to flooding, its limits must be identified. These are shown on Map. No. 11.

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[7] These data are presented on Maps 9, 10 and 11

[8] Jones and Jones: Nooksack, Seattle, Washington, May, 1973, p. 12.
Although the Nooksack study provided the framework upon which the Little Red Deer Study was developed, many modifications or refinements were necessary, largely because the Nooksack Study was orientated only toward recreation.

MAP 10 LAND USE AND VEGETATION

LITTLE RED DEER RIVER

MAP	**10a**	Silver Lagoon to Red Deer River
MAP	**10b**	Eagle Hill to Silver Lagoon
MAP	**10c**	Harmattan to Eagle Hill
MAP	**10d**	Elkton to Harmattan
MAP	**10e**	Little Red Estates to Elkton
MAP	**10f**	Forest Reserve to Little Red Estates

SCALE 1:50,000
1 cm = 0.5 km (500 m)
1¼ inches = 1 mile approximately

PREPARED BY R.D.R.P.C. 1978

LEGEND

LAND USE	
C	cropland
P	pasture
W	water
F	feedlot
M	sand or gravel mining

NATURAL VEGETATION	
WS	white spruce
BS	black spruce
PP	lodgepole or jack pine
S	willow
A	aspen or balsam poplar
O	organic
G	grassland

TOPOGRAPHY

Symbol	Description	Percent Slope
L	level to gently undulating	0-2%
v	undulating	2-5%
gr	gently rolling	5-9%
mr	moderately rolling	9-15%
sr	strongly rolling	15-30%
h	hilly	30-60%
vh	very hilly	60

CONVENTIONS

$\dfrac{\text{USE OR VEGETATION}}{\text{TOPOGRAPHY}}$

One symbol = symbol applied to 90% of the unit.
+ = first symbol is dominant, but second is almost as plentiful.
( ) = first symbol is dominant, but second occupies > 10% of unit.

SYMBOLS

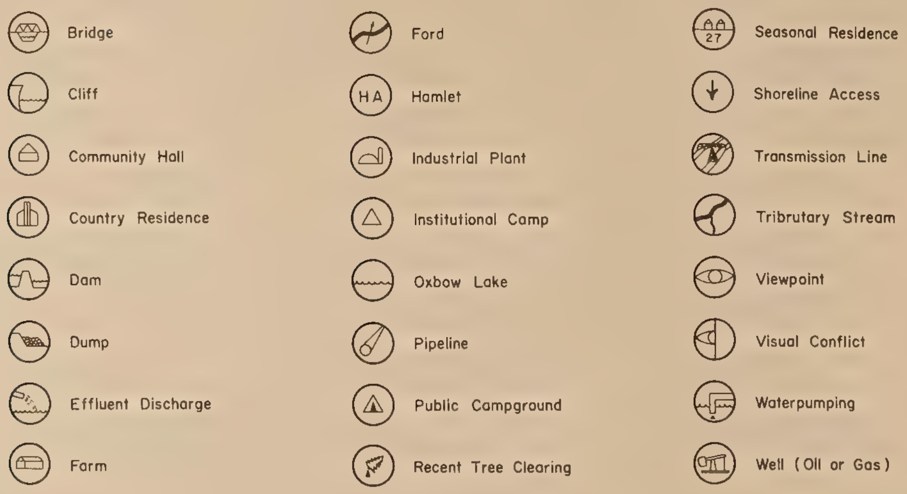
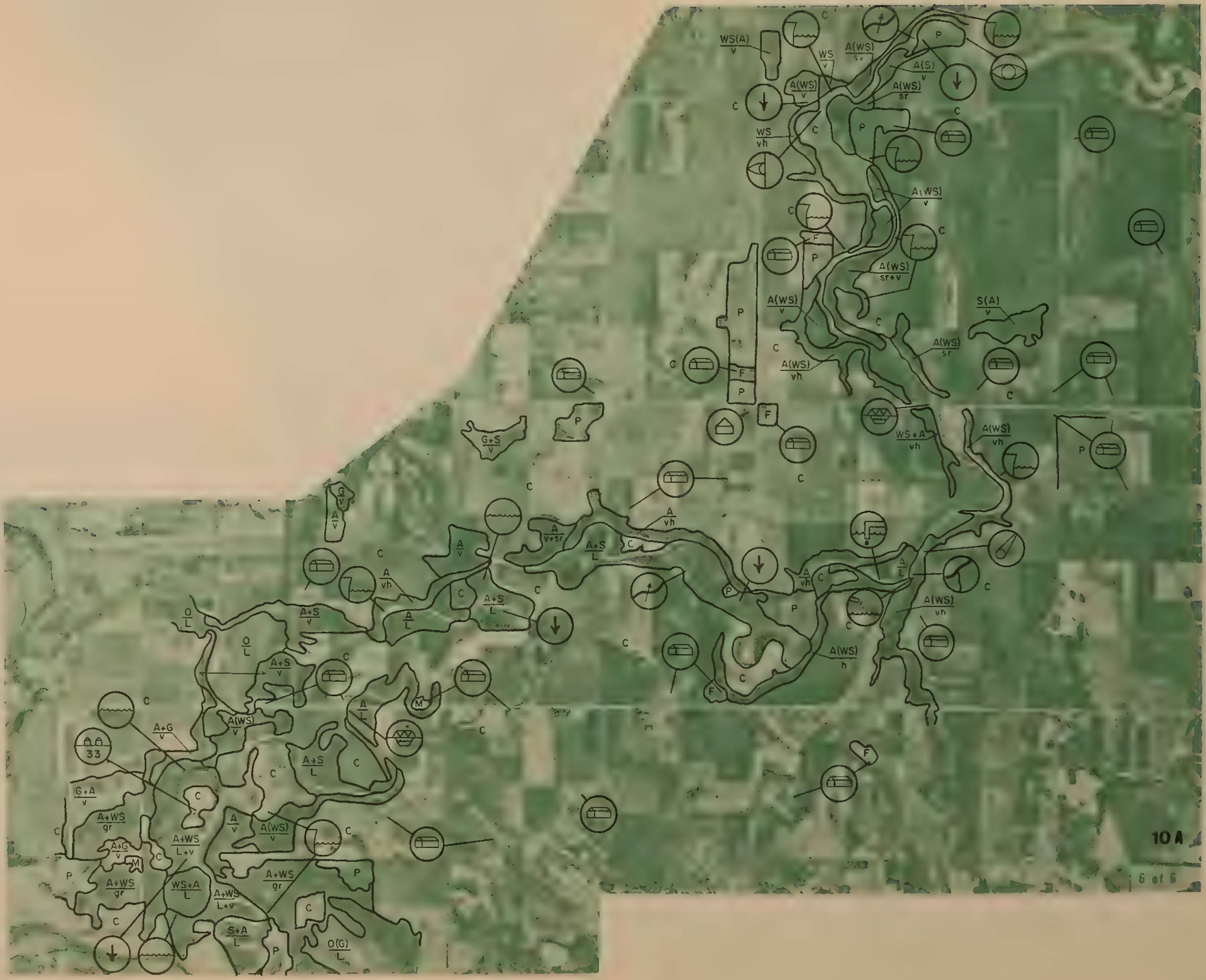
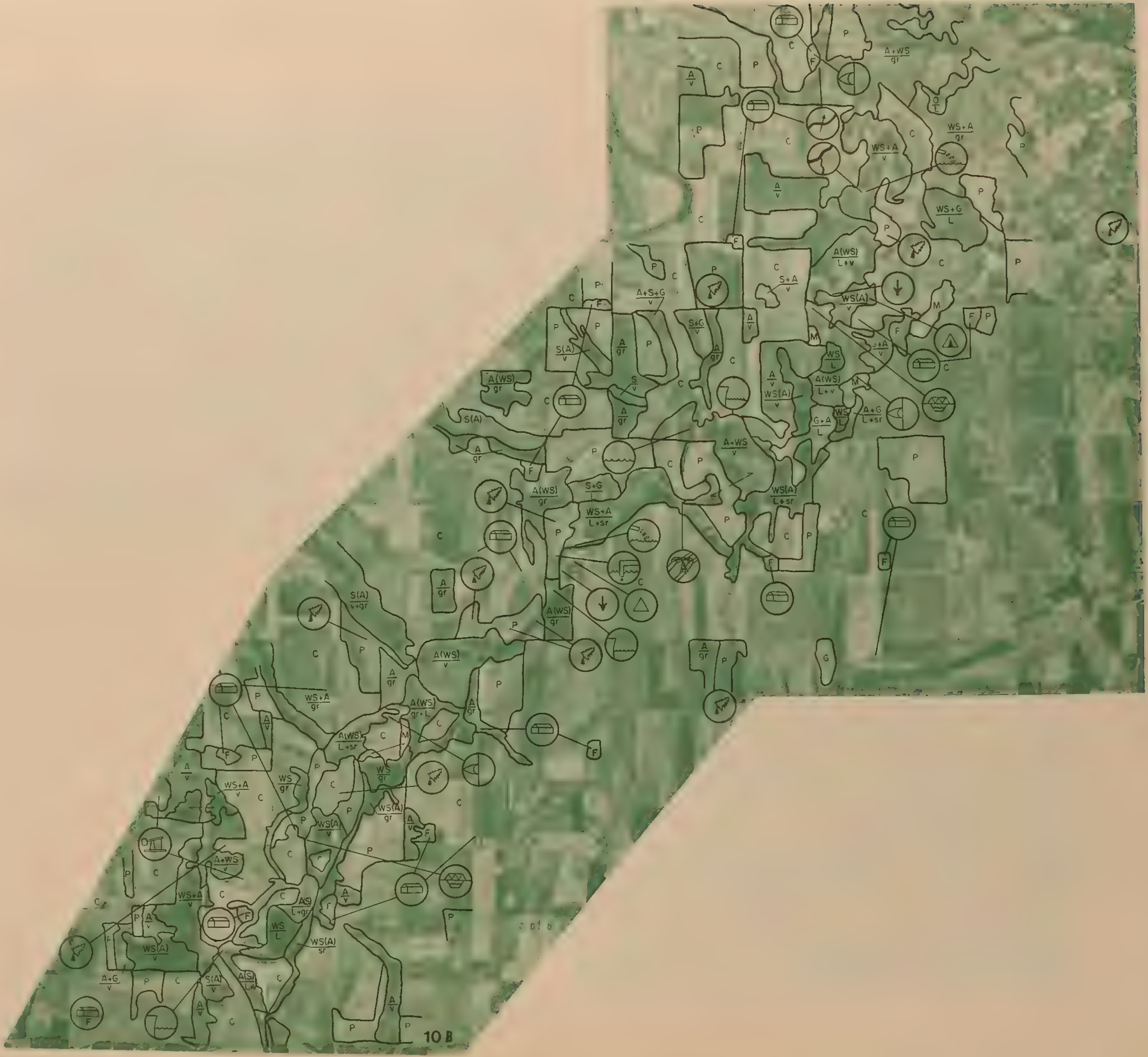


Photo Interpretation by Ptarmigan Aerial Surveys


10A
6 of 6



A+WS / gr
WS+A / gr
WS+A / v
WS+G / L
A(WS) / L+v
S+A / v
WS(A) / v
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S+G / v
S(A) / v
A / gr
A / v
S / v
A(WS) / gr
S(A)
WS / L
G+A / L
A+G / L+sr
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A(WS) / L+sr
WS / gr
WS(A) / gr
A+WS / v
WS+A / v
A(S) / L+gr
WS(A) / sr
A+G / v
A(S) / L
C
P
F
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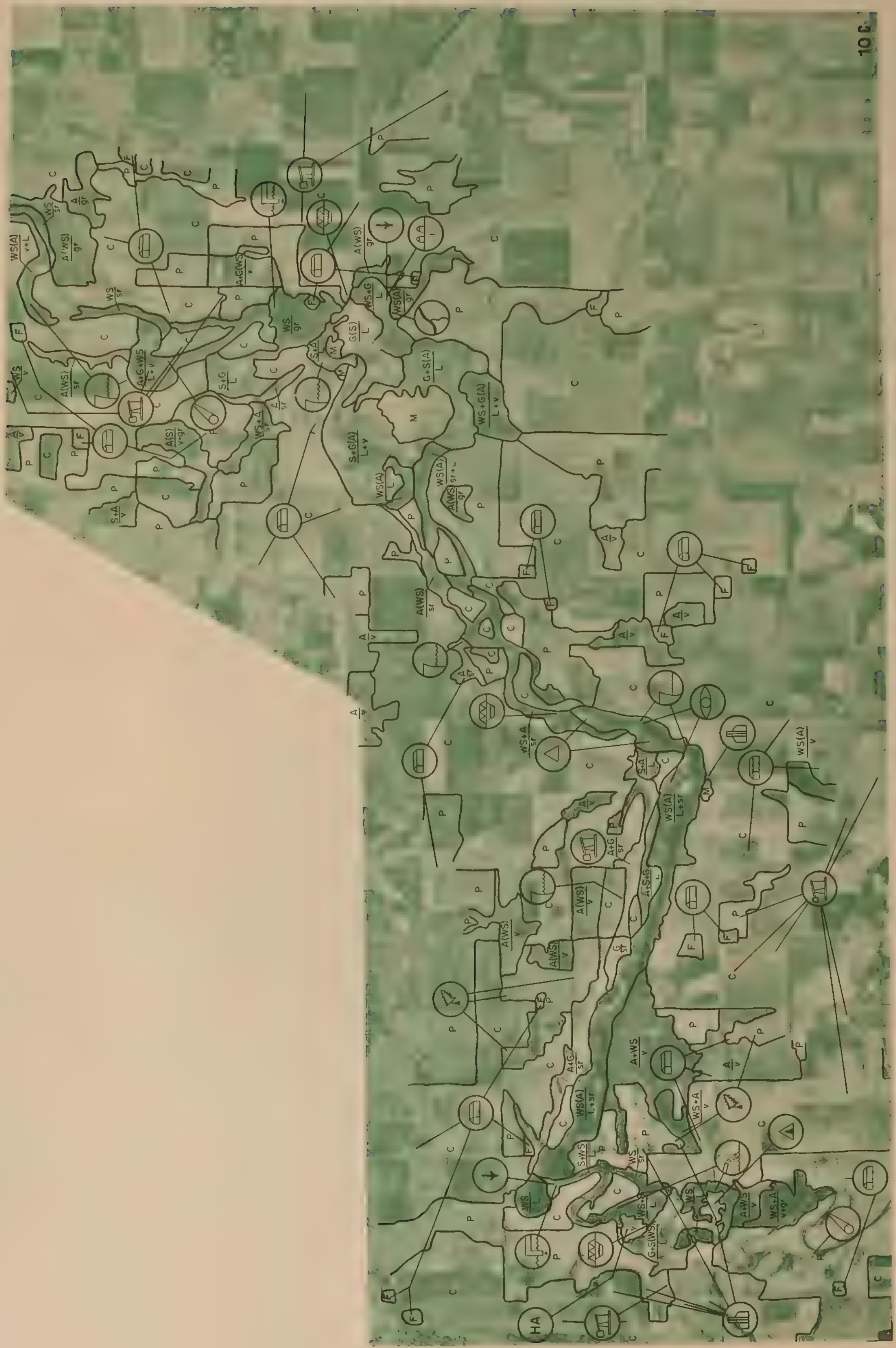
G
O / T

10 B


10 G
WS(A) / v+L
A(WS) / gr
WS / sr
A / gr
WS / gr
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S+G / L
A(S) / v+gr
WS+A / sr
S+A / v
A / v
G(S) / L
S+A
WS+G / L
WS(A) / gr
G+S(A) / L
WS+G(A) / L+v
S+G(A) / L+v
WS(A) / L
WS(A) / sr+L
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A(WS) / sr
WS+A / sr
S+A / L
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A+G / sr
A+S+G / L
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G / sr
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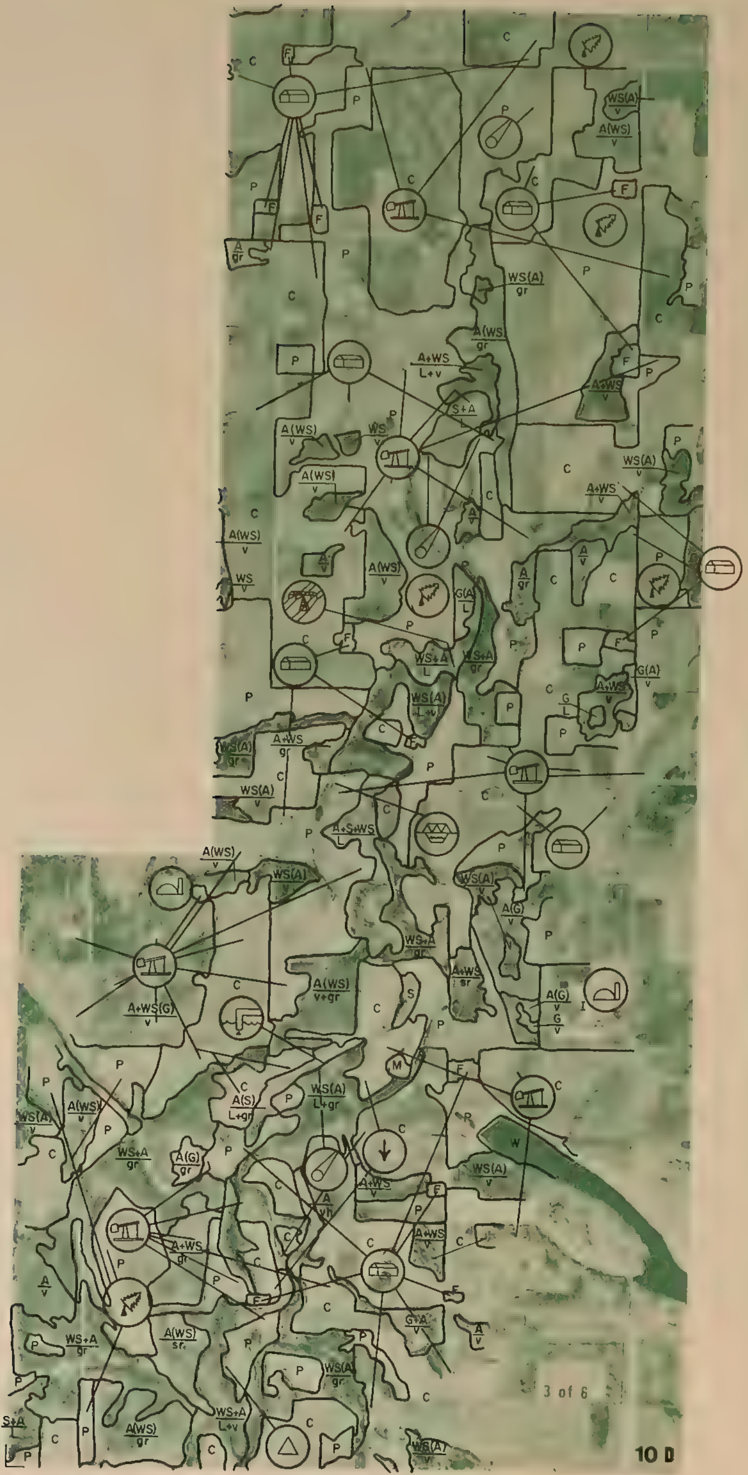
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F
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A(WS)/v
WS/v
A(WS)/v
WS(A)/v
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A(WS)/v
WS/v
A/gr
G(A)/L
A/v
WS+A/L
WS+A/gr
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G/L
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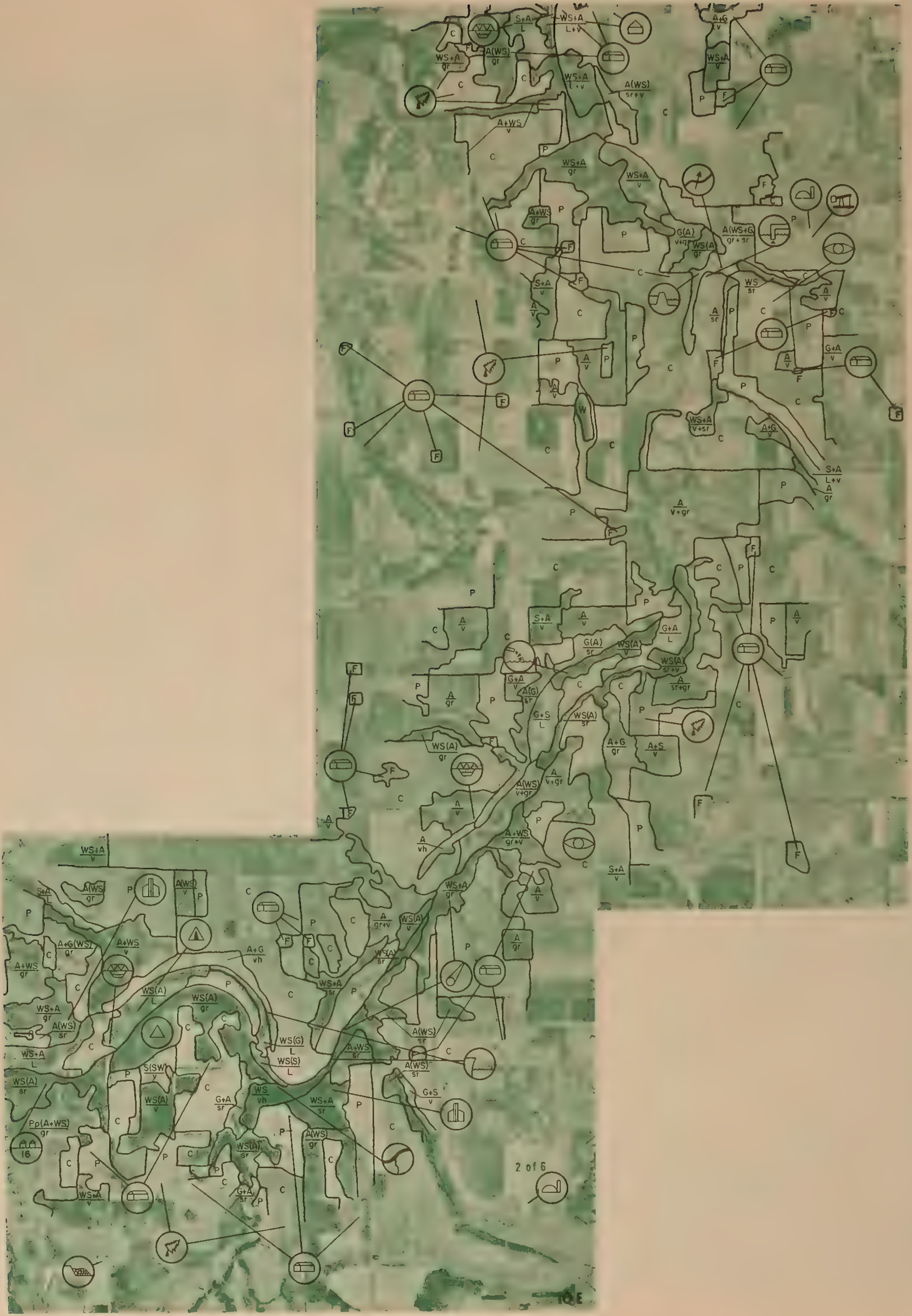
WS(A)/v
A+S+WS
A(WS)/v
WS(A)/v
WS(A)/v
A(G)/v
WS+A/gr
A+WS/sr
A(WS)/v+gr
A+WS(G)/v
S
A(G)/v
G/v
I
M
A(WS)/v
WS(A)/v
A(S)/L+gr
WS(A)/L+gr
WS+A/gr
A(G)/gr
W
WS(A)/v
A+WS/v
A/vh
A+WS/gr
A+WS/v
A/v
G+A/v
A/v
WS+A/gr
A(WS)/sr
WS(A)/gr
WS+A/L+v
S+A
A(WS)/gr
WS(A)/v
3 of 6

10 D


S+A/L
WS+A/L+v
A+G/v
C
WS+A/gr
A(WS)/gr
C
WS+A/L+v
A(WS)/sr+v
WS+A/v
P
F
A+WS/v
C
P
WS+A/gr
WS+A/v
A+WS/gr
P
P
F
C
G(A)/v+gr
WS(A)/gr
A(WS+G)/gr+sr
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WS+A/v+sr
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A(WS)/v+gr
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A/v
A/vh
A+WS/gr+v
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S+A/v
WS+A/v
S+A
A(WS)/v
A(WS)/v
P
P
C
P
A+G(WS)/gr
A+WS/v
A/gr+v
WS(A)/v
C
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A+WS/gr
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A+G/vh
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WS(A)/sr
P
A/gr
C
WS+A/sr
C
P
WS+A/gr
WS(A)/L
WS(A)/gr
A(WS)/sr
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WS+A/L
WS(G)/L
WS(S)/L
A+WS/sr
C
A(WS)/sr
WS(A)/sr
P
S(SW)/v
G+S/v
C
WS(A)/v
G+A/sr
WS/vh
WS+A/sr
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Pp(A+WS)/gr
16
C
P
A(WS)/gr
C
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WS(A)/sr
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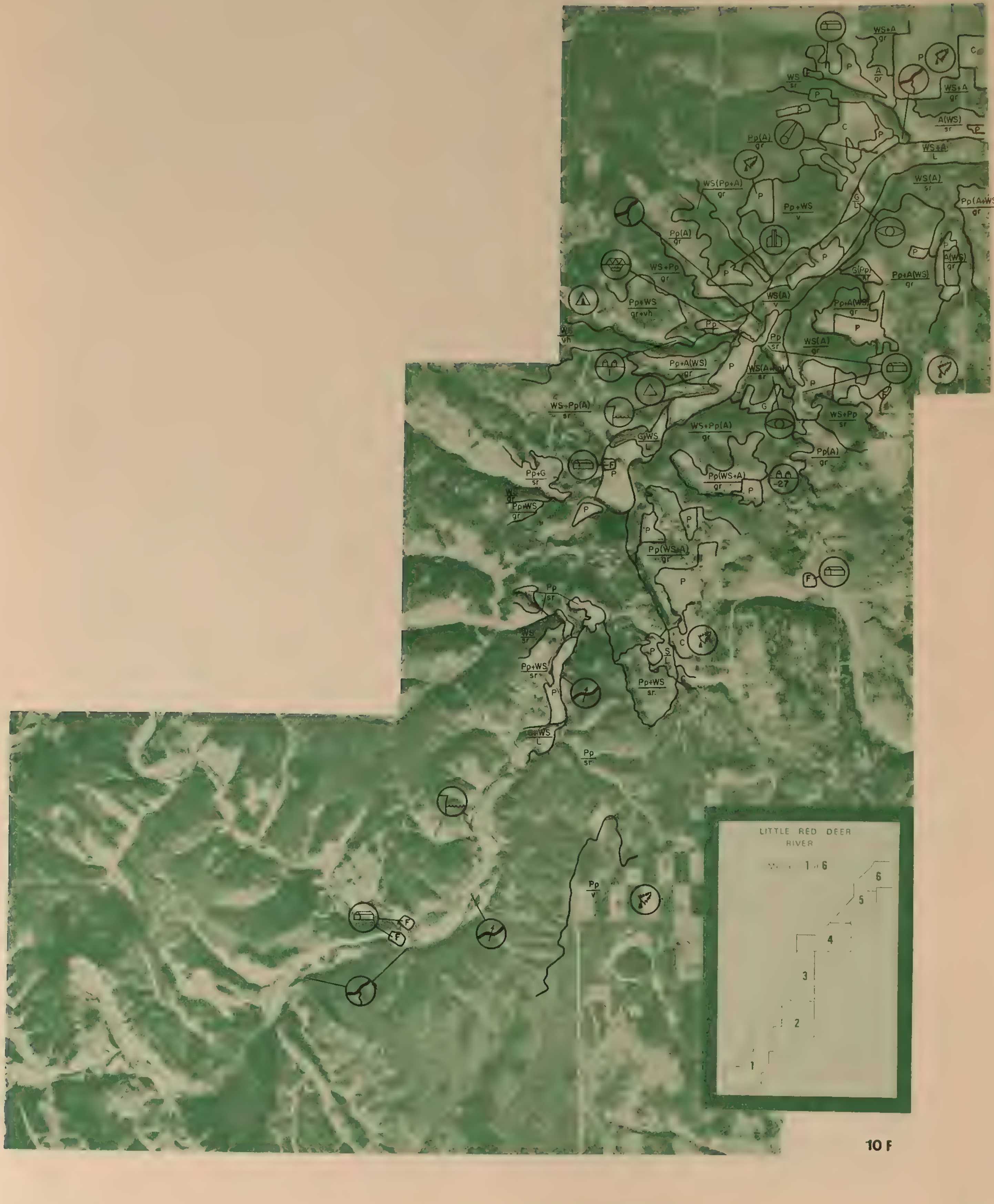
WS+A/v
G+A/sr
C
P
2 of 6
10.E


LITTLE RED DEER RIVER
Map 1 of 6
1
2
3
4
5
6
WS+A gr
A gr
WS sr
P
C
WS+A gr
A(WS) sr
Pp(A) gr
WS+A L
WS(A) sr
Pp(A+WS) gr
WS(Pp+A) gr
Pp+WS v
G L
Pp(A) gr
A(WS) gr
WS+Pp gr
G(Pp) gr
Pp+A(WS) gr
Pp+WS gr+vh
WS(A) v
Pp+A(WS) gr
WS vh
Pp
Pp sr
WS(A) gr
Pp+A(WS) gr
WS(A+Pp) gr
WS+Pp(A) sr
G
WS+Pp(A) gr
WS+Pp sr
G+WS L
Pp(A) gr
Pp+G sr
Pp(WS+A) gr
27
WS gr
Pp+WS gr
Pp(WS+A) gr
F
Pp sr
WS sr
S L
Pp+WS sr
Pp+WS sr
G+WS L
Pp sr
Pp v
F

Within the floodplain is the streamway, which is that part of the river system which includes the water in the river, its bed and its shorelands up to the bank-full level.[9] Here the flora and fauna, soil and topography are influenced by the height and velocity of the fluctuating river currents. Within the streamway lies the river channel itself, which is constantly adjusting its course within its streamway and floodplain. (See Figure 6). Besides these, the overall riverscape includes the valley sides, and significant portions of the upland or watershed.

Any complete study of a river should include its total watershed since the watershed is the physical area within which continuous river processes and drainage regimes operate. It should include all land within the functional boundaries of the river channel, streamway, floodplain, and valley and should be extended to also include the perceived viewshed. Not only are the lands within the riverscape essential to proper management of the river, but within the riverscape may be found the full range of natural, cultural and esthetic characteristics which contribute to the benefits available from the river. In this Study, the riverscape is confined to a narrow corridor arbitrarily delimited along the river valley and including the streamway itself and a narrow corridor extending only a short distance (1 km) beyond the actual stream banks. (See Map 3).

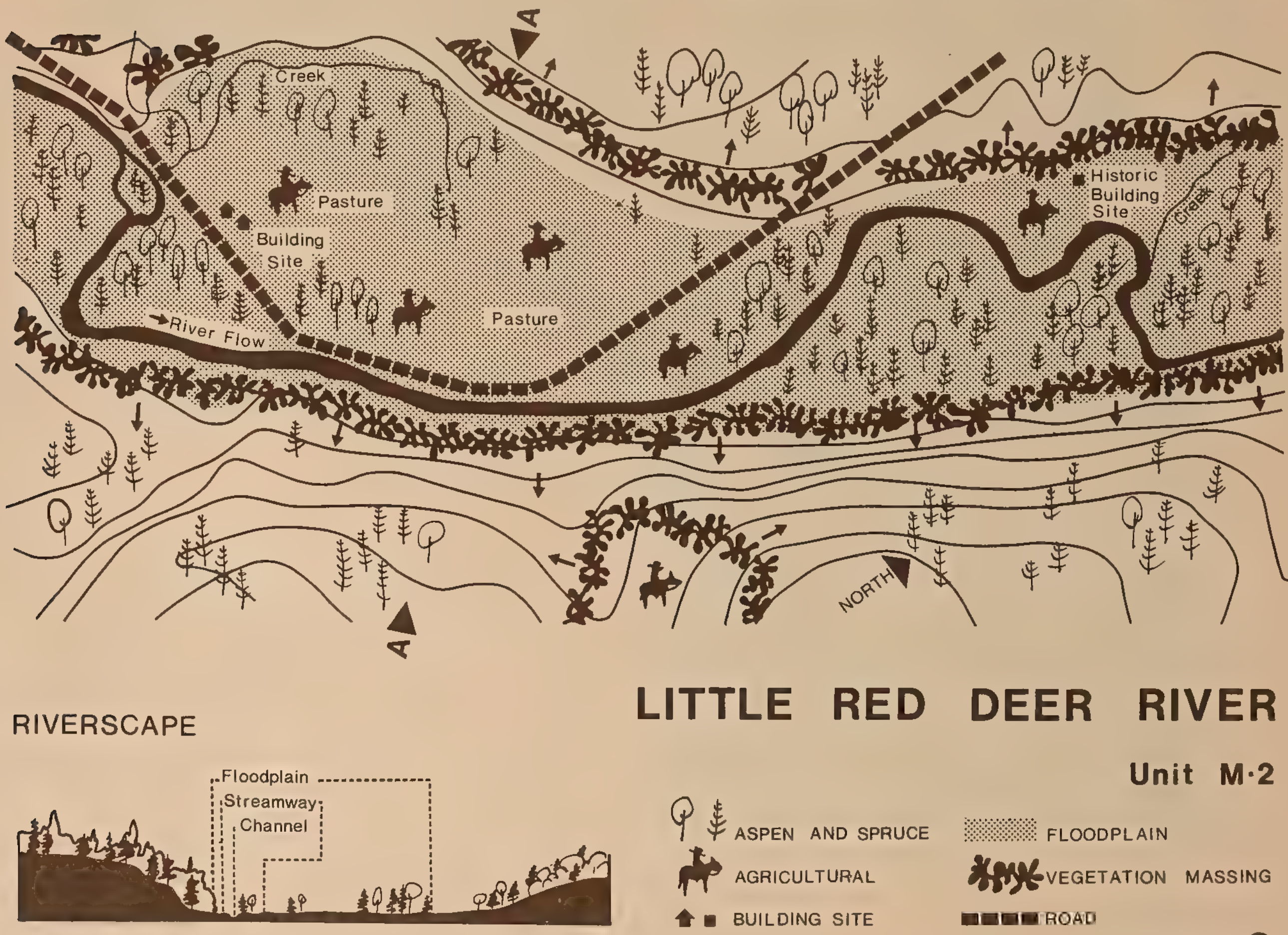
2. Rivers Can Be Divided Into a Hierarchy of Segments.

In order to effectively gather and record data on the elements and processes at work along the river, it is necessary to establish a hierarchy of river segments which can serve as an immediate framework for inventory and a subsequent basis for evaluation.

Considering the river as a whole, we can break it down into parts which may be called "segments of experience". At various scales of consideration various minimum sized meaningful segments can be identified. At a small scale review, where the minimum meaningful size segment will be quite large, they may most appropriately be called physiographic regions. Along the Little Red Deer River the minimum distinctive regional areas are the foothills and the western Alberta plains. Using a slightly larger scale the minimum distinctive river sub-regions could be defined. In this Study four have been identified: Grease Creek, the upper mainstem, Dogpound Creek to Silver Creek and the downstream segment from the Dogpound

---

[9] W. Bauer, 1972 defined the streamway as the - " -- channels within which the usual seasonal or storm water runoff peaks are contained, and within which environment the flora, fauna, soils and topography is dependent on or influenced by the height and velocity of the fluctuating river currents."



LITTLE RED DEER RIVER

Figure 6

MAP II EROSION HAZARD

LITTLE RED DEER RIVER

SCALE 1:50,000
1 cm = 0.5 Km (500 m)
1¼ inch = 1 mile approximately

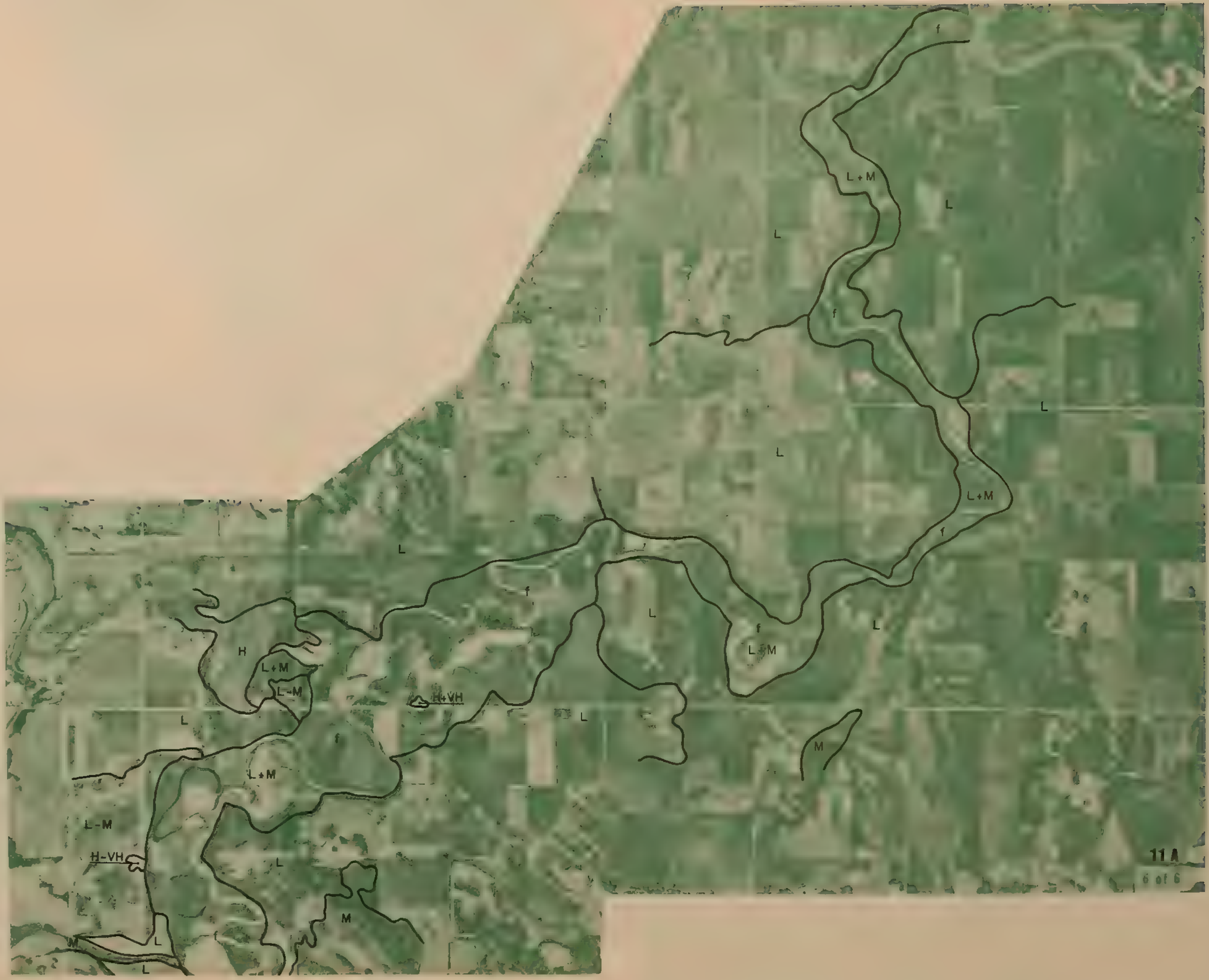
PREPARED BY R.D.R.P.C. 1978

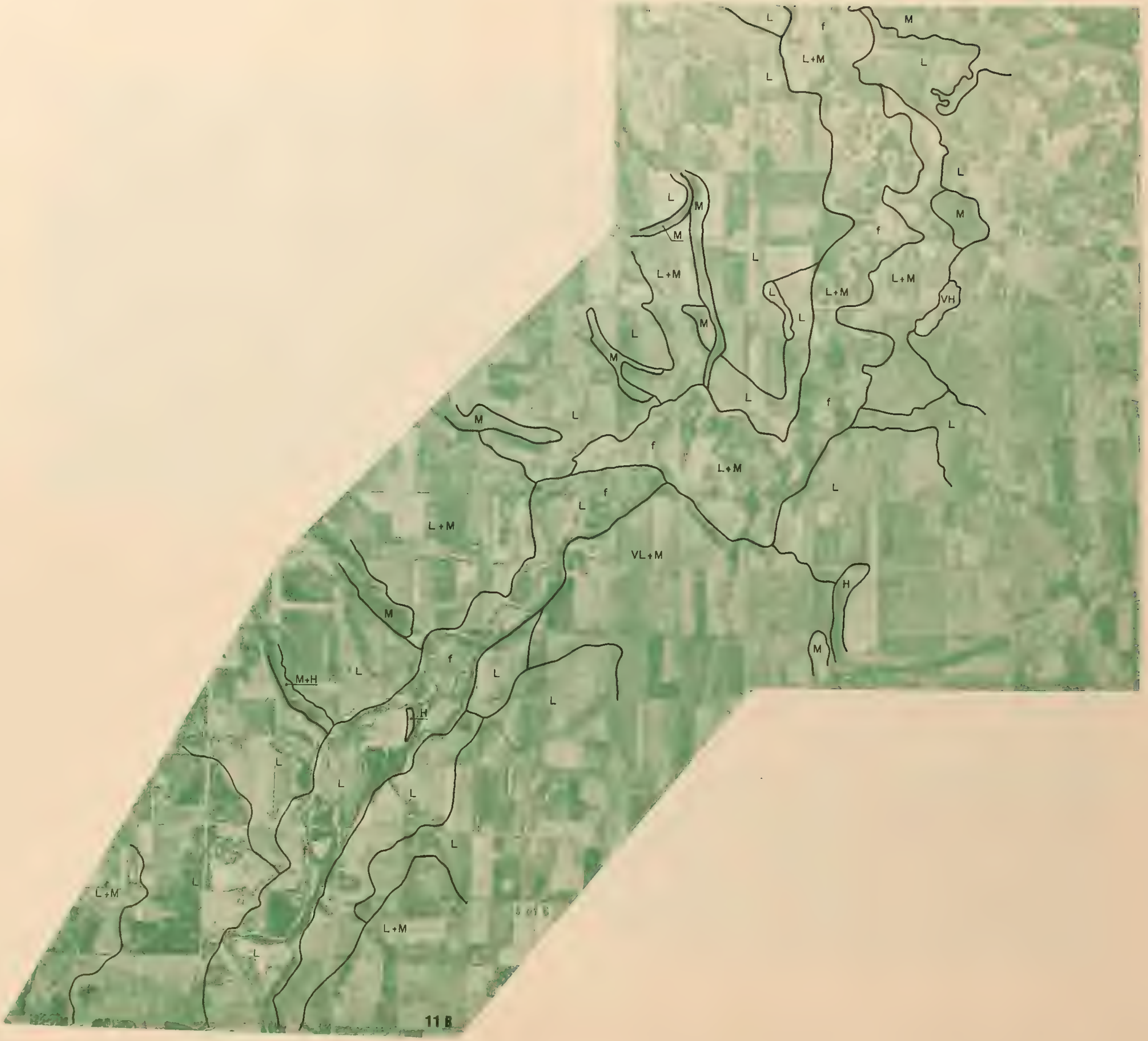
MAP	**IIa**	Silver Lagoon to Red Deer River
MAP	**IIb**	Eagle Hill to Silver Lagoon
MAP	**IIc**	Harmattan to Eagle Hill
MAP	**IId**	Elkton to Harmattan
MAP	**IIe**	Little Red Estates to Elkton
MAP	**IIf**	Forest Reserve to Little Red Estates

LEGEND :

Very Low Hazard Lands	VL
Low Hazard Lands	L
Moderate Hazard Lands	M
High Hazard Lands	H
Very High Hazard Lands	VH
Floodplain	f
10-25% of unit has second rating	+
equal distribution of both ratings	-

Photo Interpretation by Ptarmigan Aerial Surveys


11 A
6 of 6
L
L+M
f
L-M
M
H
H+VH
H-VH



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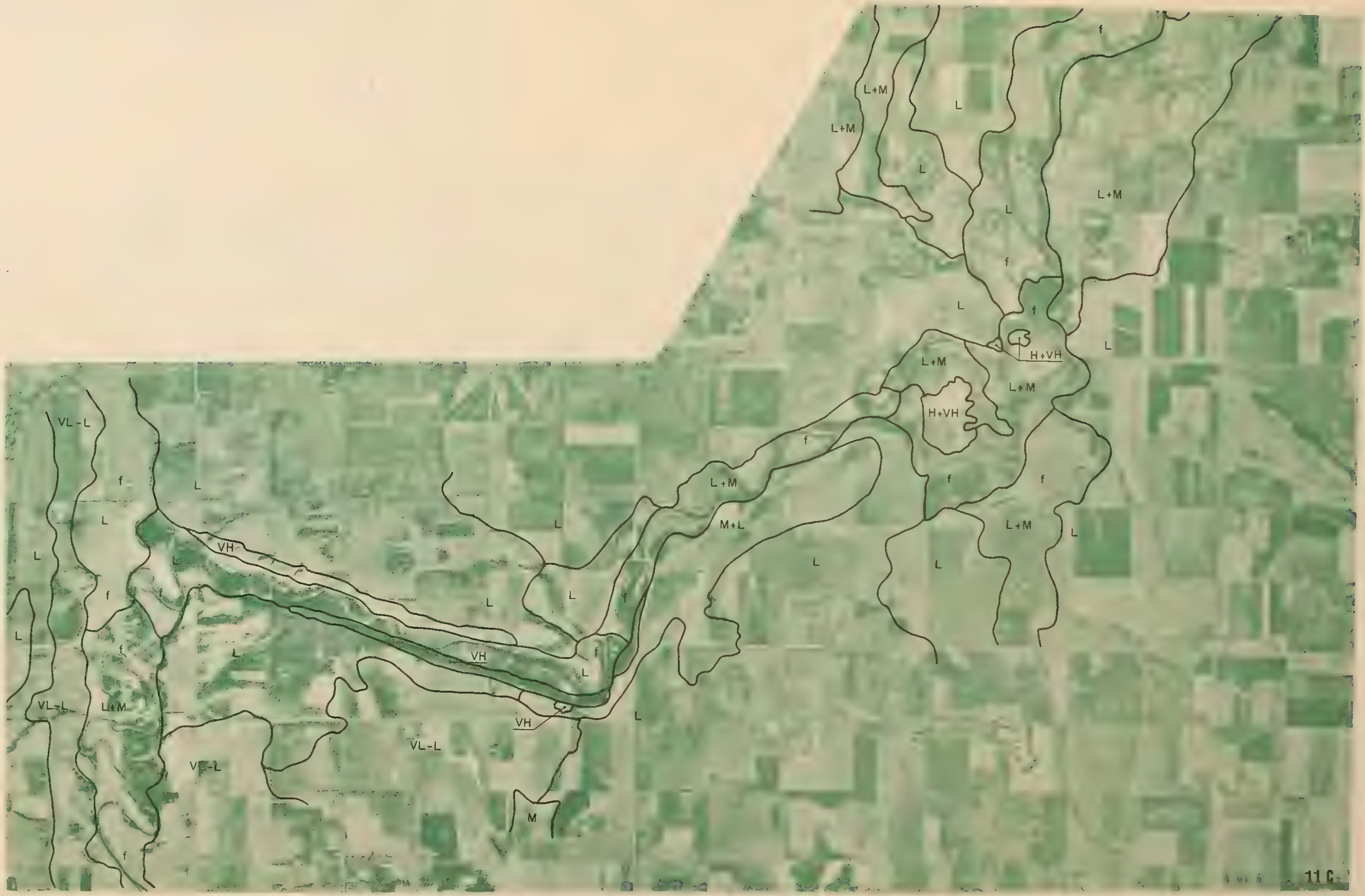
11 B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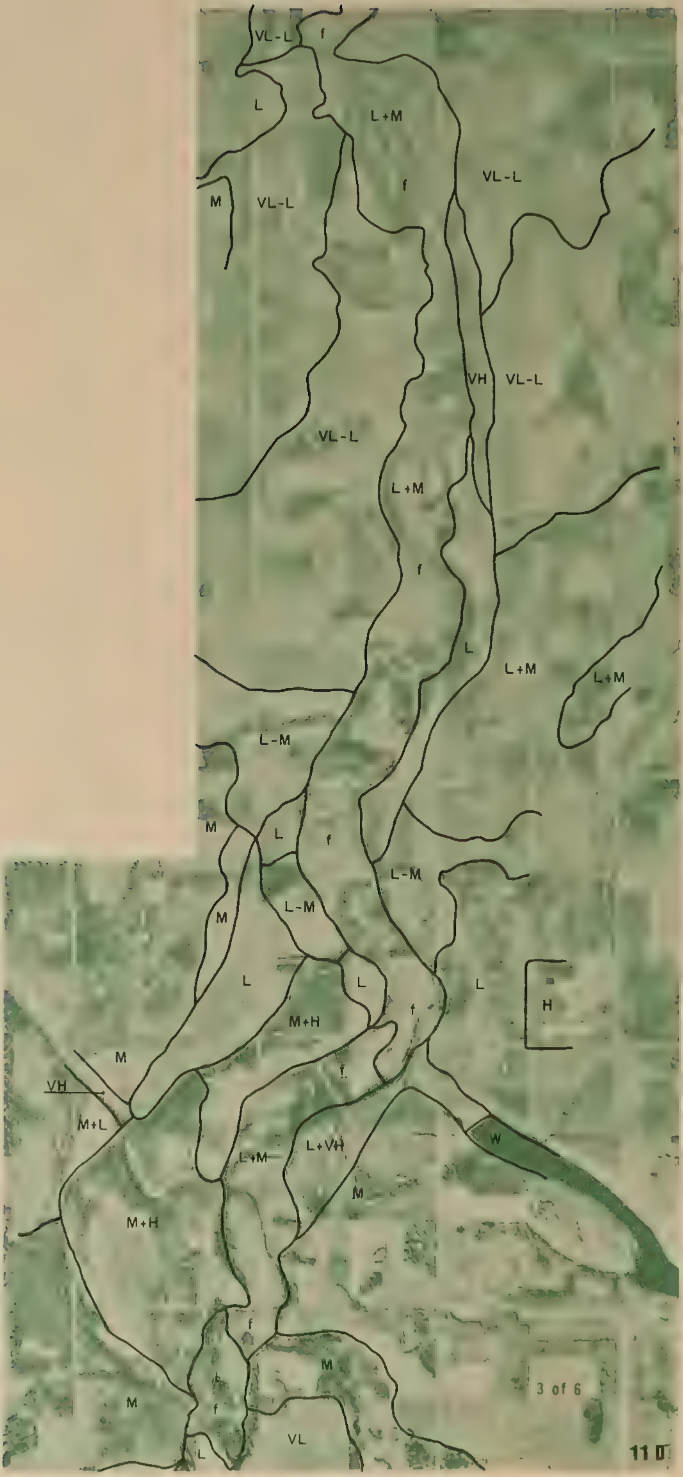
11 C


VL - L
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H
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M + H
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VH
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3 of 6
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f
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VL
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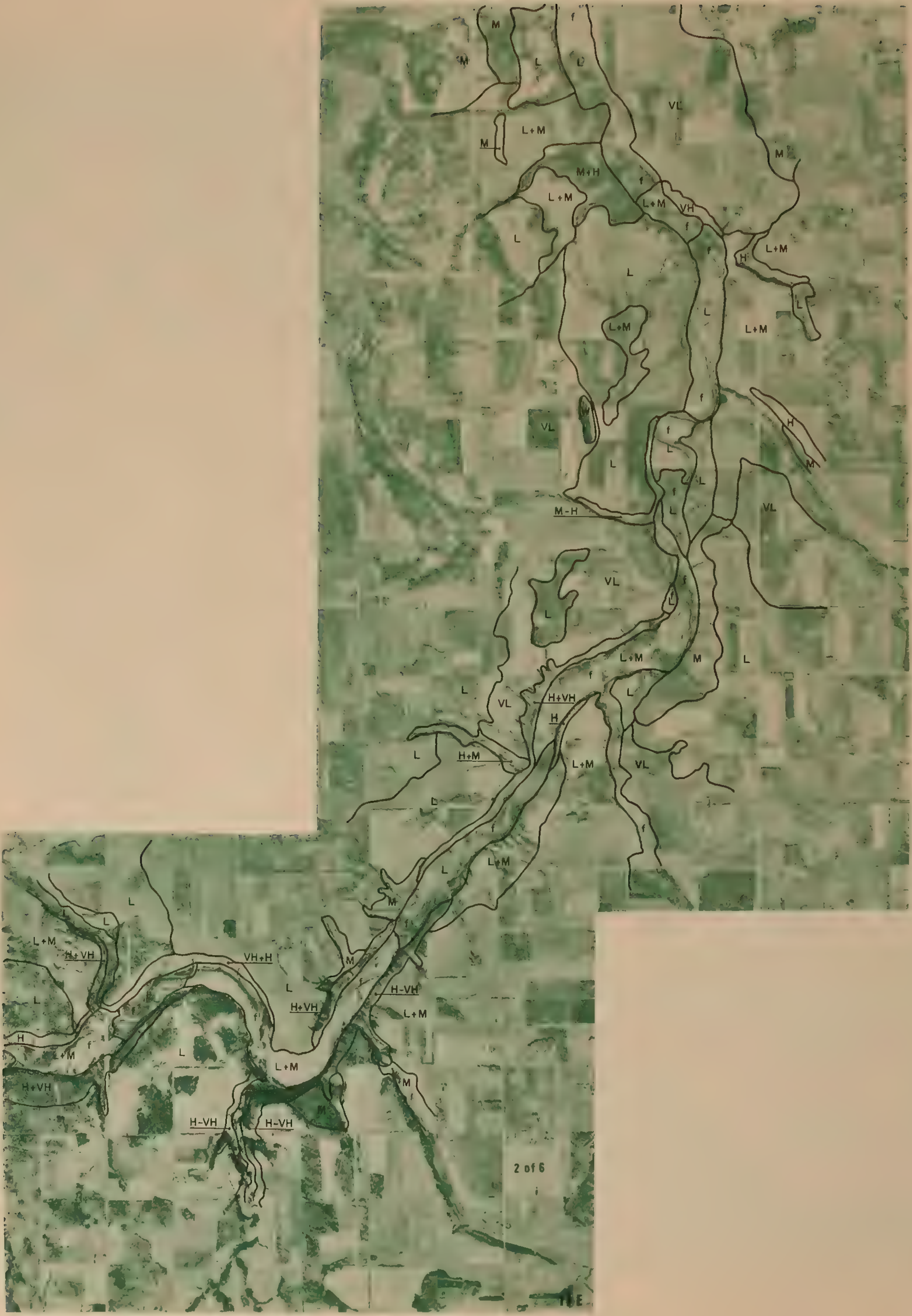

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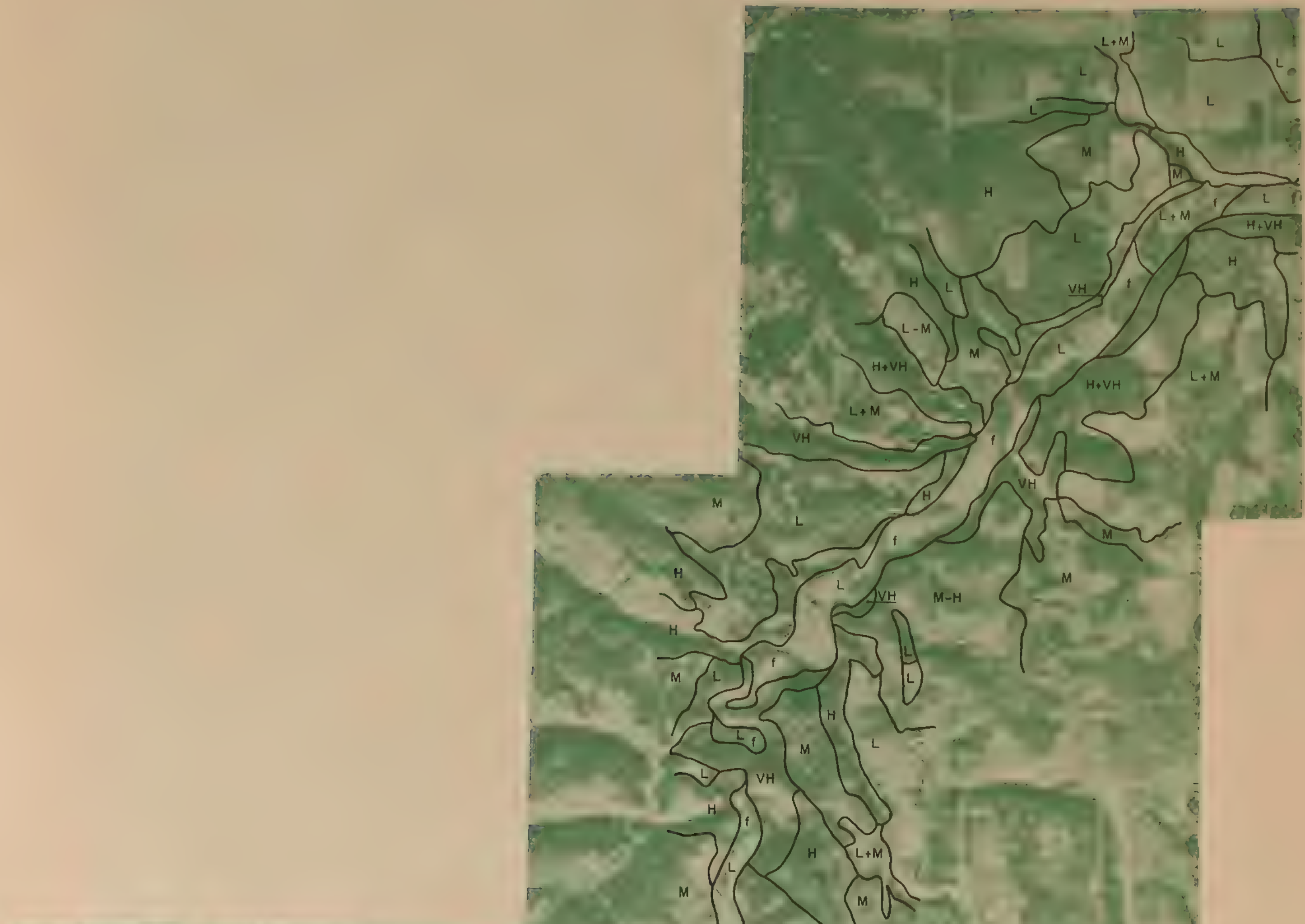
2 of 6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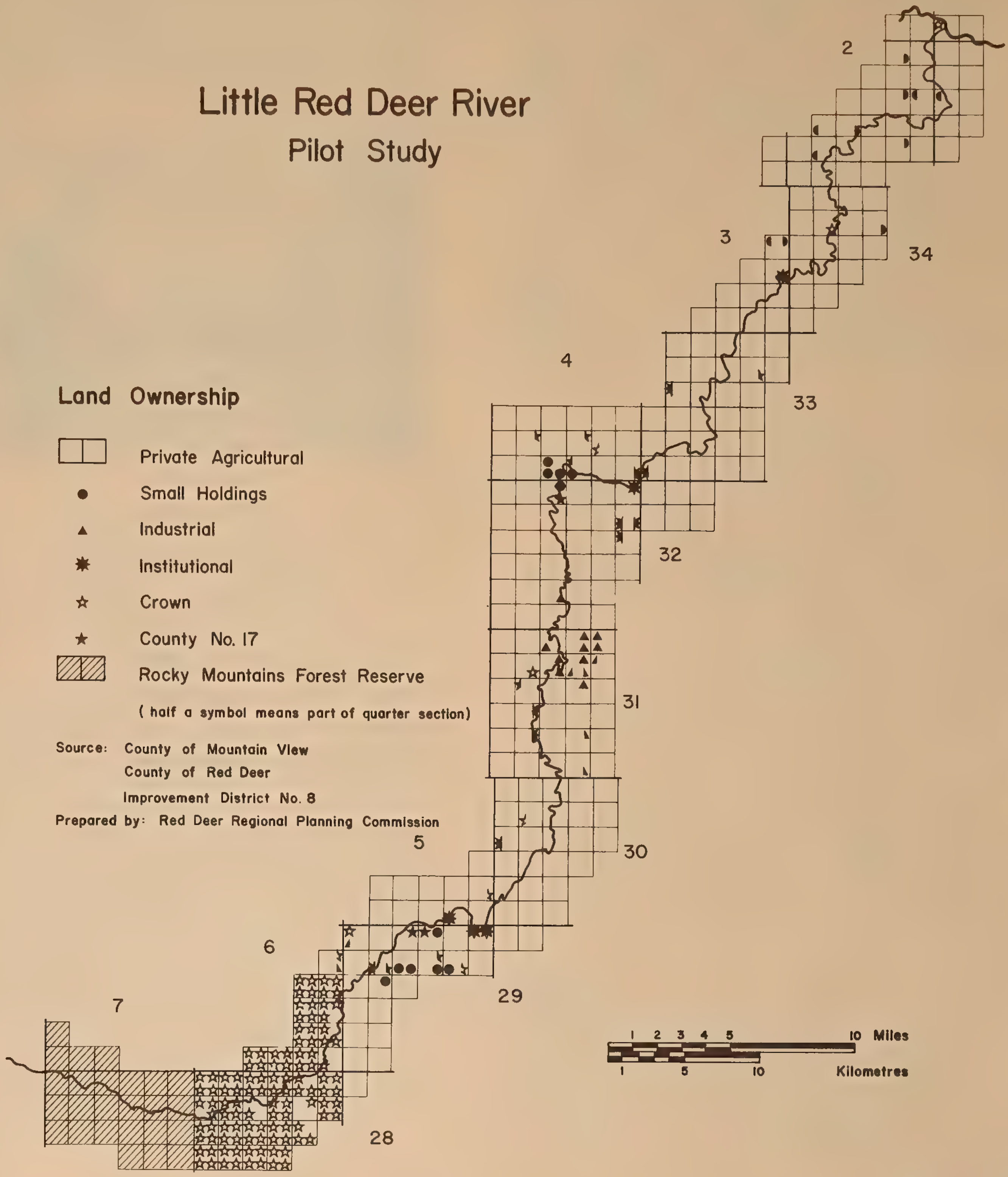
Little Red Deer River
Pilot Study



Land Ownership

- ◫ Private Agricultural
- ● Small Holdings
- ▲ Industrial
- ✷ Institutional
- ☆ Crown
- ★ County No. 17
- ▨ Rocky Mountains Forest Reserve

(half a symbol means part of quarter section)

Source: County of Mountain View
County of Red Deer
Improvement District No. 8

Prepared by: Red Deer Regional Planning Commission

MAP 12

to the Red Deer River. The minimum distinctive channel patterns can be identified at the next larger scale. These include the fixed channel, meanders, and entrenched channel. Within these patterns there are separate river reaches. Reaches are the minimum distinctive segments that occur within a given channel pattern. The outer limit of each reach is defined by the top of the valley. Each reach extends from one tributary confluence to another. Further segmentation may be pursued to identify smaller portions of the riverscape by applying larger scales and more exacting combinations of characteristics. Where this is done the smaller segments within a reach are referred to as runs. A run is the minimum distinctive segment that offers a particular benefit or experience.[10] Within a run, the minimum distinctive sense of place is referred to as a unit. The unit is the essential segment of river experience having as its outer limits, the streamway boundary.[11]

The final nested segmentation of the Little Red Deer River is shown on Figure 7. Map 14 displays these units. Names are assigned to each region, subregion, pattern and reach, but letters and numbers are used to identify the runs and units.

THE INVENTORY

3. Each River Segment Provides an Array of Characteristics Which Can Be Identified and Rated According to Their Degree of Expression. Degree of Expression is a Statement of the Quantitative or Qualitative Magnitude Demonstrated by a Characteristic.

Having established a hierarchy of river segments, it is possible to effectively gather and record data on the intrinsic elements and processes which contribute to experience within each segment. The level of experience (or use) possible on any feature in the unit is very much dependent on how strongly that feature expresses itself. So the magnitude of expression for each riverscape characteristic must be determined and recorded. The Legend for Magnitude of River Characteristics appears on Table D.

The characteristics are recorded for each unit along the river. Each characteristic is measured according to its level of occurrence (expression), with the highest score given to those elements, processes or factors exhibited in abundance or to an intense degree. A check list is filled out for each unit along the river. Once these characteristics are summarized in matrix format, we have the basic supply of riverscape resources. (See Figures 8a, 8b, 8c). So we are able to quantify the level of experience offered by each unit and to observe where heavy accumulations of characteristics which most clearly illustrate the processes and dynamics of the riverscape are located. Units possessing high accumulations are immediately of higher priority than those displaying a lesser abundance. To the greatest extent possible, the entire valley must be surveyed by canoe, on foot, from roads and bridges, from the air, and by recent photography and maps.[12]

The River was surveyed by canoe, on foot, from roads and bridges, and by helicopter.

4. Each Unit's Characteristics Can be Grouped Into Categories of Expression and Totalled to Arrive at a Summary of Landscape Expression.

After the magnitude of each characteristic is entered, its significance with respect to management requirements is identified. This is demonstrated on the Magnitude of River Characteristics matrix as Form of Expression (See Figures: 8a,8b,8c). Eleven forms of expression were selected and these are considered extensive enough to provide a meaningful evaluation for all probable shoreland management postures. Reference to the matrix reveals these forms of expression to be: uniqueness, diversity, fragility, seclusion, seasonality, sensuality, paddleability, cultivability, resource capability, site developability, and existing development. Whether or not each characteristic expresses itself in these ways and the direction (benefit or detriment) of that expression is indicated on the matrix by means of a plus or minus character or a blank space behind the form of expression and below the characteristic.

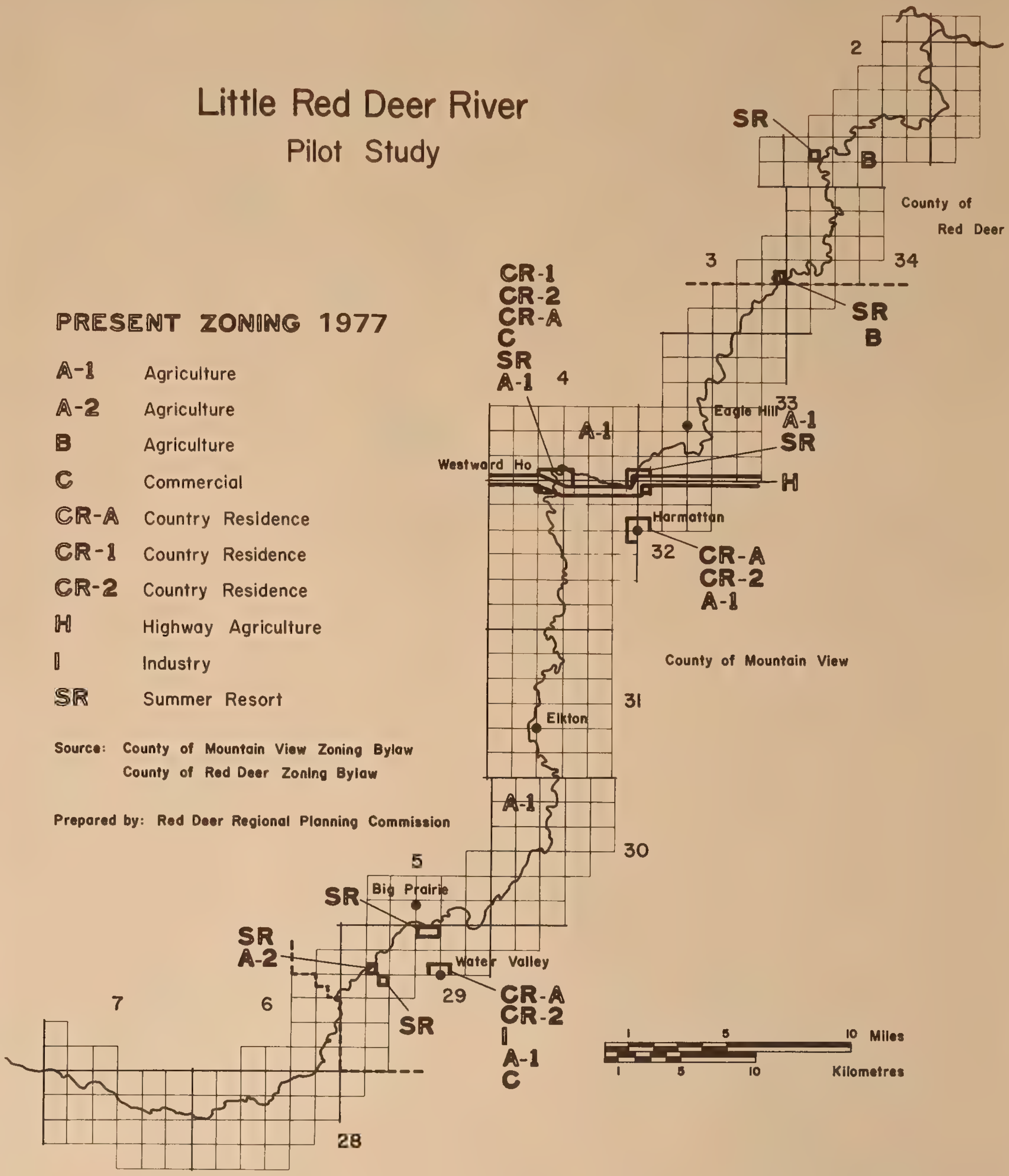
---

[10] For simplicity the runs used in this Study were adapted to segments of the river between bridges.

[11] Although a river unit is defined as including only the streamway, the inventory for this Study, which is based on the unit, considers the limit to be a longitudinal feature with undefined lateral boundaries. In most instances the Unit extends from one legal property line to another. Conditions present within any unit are quite consistent but differ somewhat from conditions in adjacent units.

[12] Within each unit, sites may be selected from which to conduct the inventory. Each site chosen must be representative of conditions and opportunities appreciative within the unit. If there is any question about the ratings these sites can be returned to for checking, reevaluation or updating. For this Study the entire unit was evaluated.

Little Red Deer River
Pilot Study



PRESENT ZONING 1977

A-1	Agriculture
A-2	Agriculture
B	Agriculture
C	Commercial
CR-A	Country Residence
CR-1	Country Residence
CR-2	Country Residence
H	Highway Agriculture
I	Industry
SR	Summer Resort

Source: County of Mountain View Zoning Bylaw
County of Red Deer Zoning Bylaw

Prepared by: Red Deer Regional Planning Commission

MAP 13

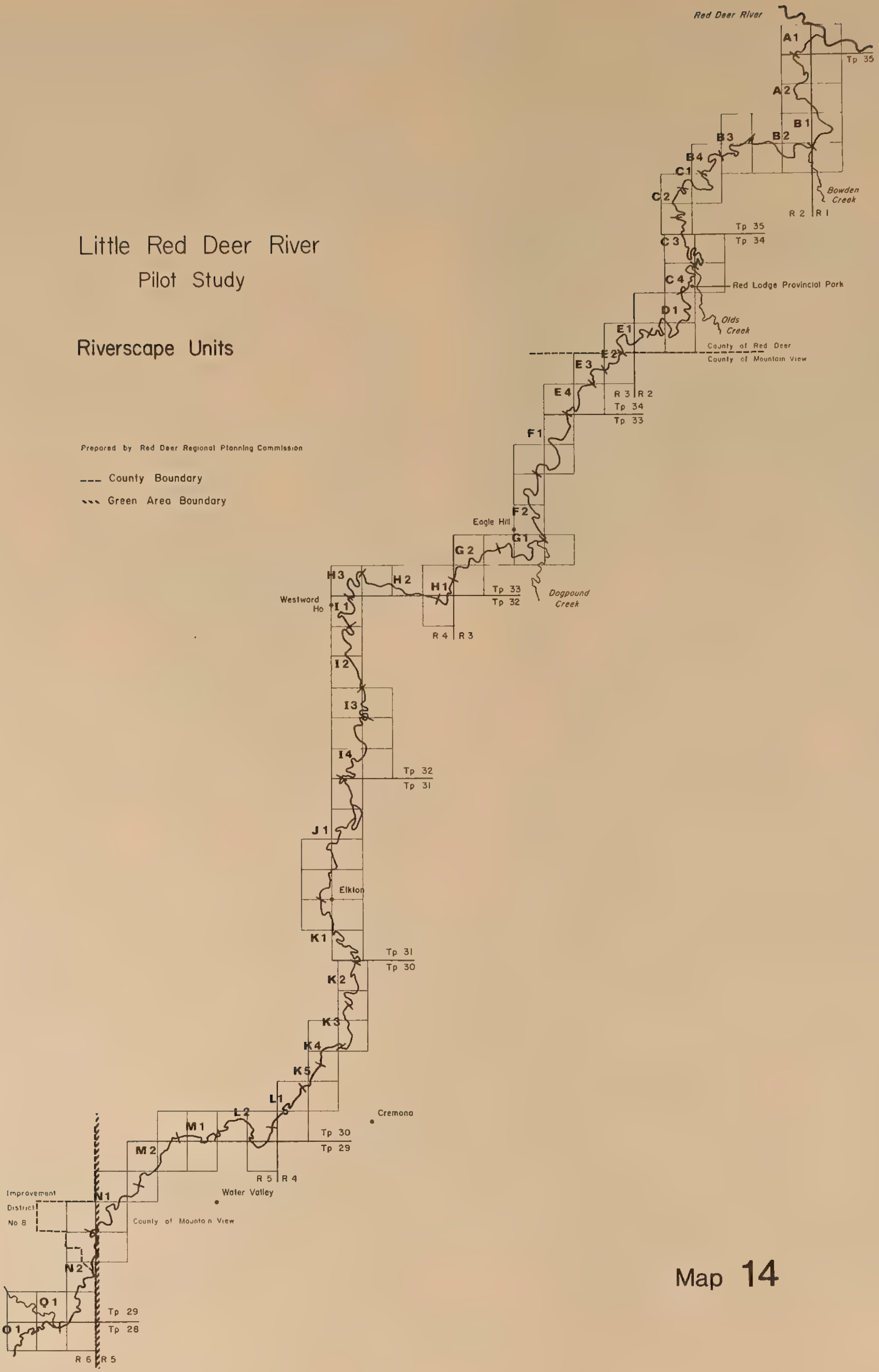
Little Red Deer River
Pilot Study

Riverscape Units

Prepared by Red Deer Regional Planning Commission

--- County Boundary

\`\`\` Green Area Boundary



Map 14

NESTED RIVER SEGMENTATION

RIVER SCAPE	REGION	SUBREGION	PATTERN	REACH	RUN	UNIT
LITTLE RED DEER RIVER STUDY AREA	WESTERN ALBERTA PLAINS	RED DEER RIVER TO DOGPOUND CREEK CONFLUENCE	MEANDERING STREAMWAY IN ENTRENCHED VALLEY	COTTONWOOD	A COTTONWOOD	A-1 R.D. River confluence to road allowance at N. of 36-35-2-5
						A-2 From A-1 to Cottonwood Road
			MEANDERING STREAMWAY IN PASTORAL VALLEY	OAKLAHOMA	B BOWDEN CREEK	B-1 Cottonwood Road to Bowden Creek
						B-2 From Bowden Ck to road allowance between sections 22,23-35-2-5
						B-3 From B-2 to road allowance between sections 16,9-35-2-5
				RED LODGE	C OLDS CREEK	C-1 From B-3 to line between N. & S. ½ of section 8-35-4-5
						C-2 From C-1 to line between N. & S. ½ of section 5-35-2-5
						C-3 From C-2 to Olds Creek confluence
						C-4 Olds Creek confluence to Bowden Road 587
				EAGLE HILL	D TRAIL CREEK	D-1 Road 587 to Trail Creek
					E GARRINGTON EAST	E-1 Trail Creek to road allowance between sections 12,13-34-3-5
						E-2 From E-1 to road allowance between sections 11,12-34-3-5
						E-3 From E-2 to road allowance between sections 2,11-34-3-5
						E-4 From E-3 to road allowance between sections 3,34-33-3-5
					F MOUND	F-1 From E-4 to road allowance between sections 28,21-33-3-5
						F-2 From F-1 to Eagle Hill Bridge
		DOGPOUND CREEK CONFLUENCE TO SILVER CREEK CONFLUENCE	MEANDERING STREAMWAY IN PASTORAL VALLEY	DOGPOUND	G DOGPOUND CREEK	G-1 Eagle Hill Bridge to midpoint of section 8-33-3-5
						G-2 From G-1 to first bridge upstream
			MEANDERING STREAMWAY IN ENTRENCHED VALLEY	CANYON	H WESTWARD HO	H-1 From bridge below Nazarene camp to midpoint of 36-32-4-5
						H-2 From H-1 to west side of section 3-33-4-5
						H-3 From H-2 to Highway 27 bridge
			MEANDERING STREAMWAY IN PASTORAL VALLEY	WESTWARD HO ELKTON	I HARMATTAN	I-1 From H-2 to road allowance between sections 28,33-32-4-5
						I-2 From I-1 to road allowance between sections 22,15-32-4-5
						I-3 From I-2 to road allowance between sections 10,15-32-4-5
						I-4 From I-3 to Bergen bridge
					J ELKTON	J-1 From Bergen bridge to Elkton bridge
				GARFIELD	K CREMONA	K-1 From Elkton bridge to weir at road between TWP 30,31
						K-2 From K-1 to midpoint of section 28-30-4-5
						K-3 From K-2 to Cremona Creek
						K-4 From Cremona Creek to midpoint of section 17-30-4-5
						K-5 From K-4 to Cremona bridge
			MEANDERING STREAMWAY IN ENTRENCHED VALLEY	BIG PRAIRIE	L STONY CREEK	L-1 From Cremona bridge to midpoint of section 1-30-4-5
						L-2 From L-1 to N. Water Valley bridge
					M SILVER CREEK	M-1 From N. Water Valley bridge to Big Prairie Creek
						M-2 From Big Prairie Creek to Silver Creek
	FOOTHILLS	UPPER MAINSTEM	MEANDERING STREAMWAY IN BROAD FLOODWAY	TRANSITION	N WATER VALLEY	N-1 From Silver Creek to Green area
						N-2 From Green area boundary to Grease Ck. confluence
			FIXED	HEADWATERS	O GREASE CK. TO TRUNK RD.	O-1 From Grease Creek to Forestry Trunk road
					P TK. RD. TO HEADWATERS	P-1 From Forestry Trunk road to headwaters
		GREASE CREEK	MEANDERING STREAMWAY IN FIXED FLOODWAY	LOWER GREASE	Q LOWER GREASE CREEK	Q-1 From Little Red Deer River to road bridge
						Q-2 From road bridge to Harold Creek confluence
				UPPER GREASE	R UPPER GREASE CREEK	R-1 From Harold Ck. confluence to first gap
						R-2 From R-1 to headwaters
				HAROLD	S HAROLD CREEK	S-1 Harold Creek from Grease Creek to headwaters

Figure 7

Table D

LEGEND FOR MAGNITUDE OF RIVER CHARACTERISTICS

ESTHETIC FACTORS

Visual Diversity *
Visual Confinement *
Availability of Vistas *
Sense of Place *
Clarity of Edge *
Complexity of Edge *
Dominant Natural Features #
Complexity of Natural Features *
Visual Response
0) unesthetic
1) lacks distinction
2) pleasant
3) scenic
Exposed Sunny Areas
0) none
1) few and small
2) moderate
3) large and numerous
Natural Disfigurements #

View of River
0) none
1) partial
2) fair
3) good
Pristineness *
Recoverability
0) natural
1) easy
2) possible
3) not feasible
Missfits #

ENVIRONMENTAL FACTORS

Water Color and Clarity
0) clear
1) some discoloration
2) moderate
3) murky
Physiochemical Water Quality *
Biological Water Quality *
Water Pollution #
Wading and Swimming
0) none
1) possible
2) localized
3) common

Debris or Litter #
Frequency of Littering
0) none
1) one
2) several
3) many
Difficulty to Clean Up #
Offensive Odors #
Noise #
Livestock and Farm Wastes #
Industrial Wastes #
Domestic and Other Human Wastes #

Integrity of Landscape
0) compatible
1) low conflict
2) moderate conflict
3) high conflict

Extent of River Expression
0) insignificant
1) ≤ 1/2 mile
2) 1/2 - 1 mile
3) > mile
Natural Shelter #

BIOLOGICAL FACTORS

Amount of Tree Cover
0) none
1) 0 - 10%
2) 11 - 50%
3) 51% +
Diversity of Vegetation *
Species of Vegetation
Balsam Poplar
Black Spruce
White Spruce
Trembling Aspen
Pine
Fir
Willow
Alder
Natural Forage #

Condition of Vegetation
0) none
1) decadent
2) immature or somewhat decadent
3) healthy and mature
Height of Trees
0) none
1) low (< 3M)
2) moderate (3 - 10M)
3) high (> 10M)
Species of Wildlife
Ungulates, Upland birds
Waterfowl, fish
Water Mammals
0) none
1) one or two
2) several
3) many
Quality of Habitat *
Extent of Habitat *
Spawning Areas
0) none
1) possible
2) present
3) extensive
Algae Growth #

GEOMORPHIC FACTORS

Topography
0) flat or floodplain
1) undulating to G. Rolling
2) rolling to hilly
3) very hilly to mountainous
Local Relief or Valley Side Height
0) none
1) ≤ 5M
2) 5 - 25M
3) > 25M
Valley Enclosure (height/width)
0) none
1) low (1/5)
2) moderate
3) high (> 1/1)

Slope
0) none
1) gentle
2) moderate
3) steep
Parent Material
0) rock
1) glacio-fluvial
2) till
3) lacustrine
Soil Texture
0) organic
1) coarse
2) moderate
3) fine
Soil Type
0) disturbed land or gleysol
1) regosol
2) luvisol or podsol
3) chernozem
Soil Drainage
0) swampy
1) poor
2) imperfect
3) well drained

Soil Productivity *
Instability *
Erosion Evidence #
Terraces #
Valley Side Topography
1) irregular
2) terraced
3) hillside
Valley Width
0) indistinct
1) narrow (< 100M)
2) moderate (100 - 300M)
3) wide (> 300M)
Width of Valley Bottom
0) none
1) narrow (2 x stream width)
2) moderate (3 x tream width)
3) wide (> 3 x stream width)
Riverine Process Features
0) none
1) meander scars
2) abandoned channels
3) flood hazard areas

Offstream Water Bodies #
Swamps, Bogs, Marsh #
Amount of Floodplain #

River Pattern
0) single and straight
2) meander
3) braided
4) entrenched
Gradiant *
Bed Material
1) boulders and bedrock
2) cobbles and boulders
3) silt and cobbles
Bank Material
1) rock
2) cobbles
3) silt, gravel and til

Bank Height
1) low (< 1M)
2) moderate (1 - 3M)
3) high (>3M)
Sand Bars (No. and % of Shore)
0) none
1) 0 - 10%
2) 11 - 50%
3) 51 % +
Steep Cliff Banks (No. and % of Shore)
0) none
1) 0 - 10%
2) 11 - 50%
3) 51% +

Slump Features #
Deposition of Sediments *
Mud Flats #
Channel Length to Distance
1) < 1.5/1
2) 1.5 - 2/1
3) > 2/1
Islands in Channel
0) none
1) small
2) medium
3) large

HYDROLOGIC FACTORS

Normal Summer Flow *
Variability of Annual Flow *
Width of Streamway
1) below average
2) average
3) above average
Depth of Water
1) very shallow
2) some shallow areas
3) deep
Velocity of Flow
1) placid
2) rippling
3) fast
Tributaries
0) none
1) local channels
2) small and intermittent
3) perennial stream
Pools and Riffles #

DEVELOPMENT FACTORS

Vehicle Crossings
0) none
1) ford
2) culvert or bridge
3) multiple facilities
Access
0) none
1) possible
2) reasonable
3) easy
Roadway
0) none
1) trail
2) gravel
3) hard surface
Potential to Develop Access *
Extent of Access
0) none
1) nearby
2) occasional
3) considerable

Archaeological Site
0) none
1) possible
2) present
3) prominent
Historical Site
0) none
1) possible
2) present
3) prominent
Extent of Clearing
0) none
1) 10%
2) 11 - 50%
3) 51% +
Recent Clearing #
Amount Cultivated
0) none
1) < 10%
2) 11 - 50%
3) 51% +
Agricultural Crops
0) none
1) grazing
2) forage
3) grain
Farm Buildings
0) none
1) sheds or bins
2) farmstead
3) feedlot
Number of Farmsteads
0) none
1) one
2) < 5
3) several
Livestock Grazing #
Livestock Confinement
0) none
1) some cattle
2) small feedlot
3) large feedlot
Residential
0) none
1) one
2) <10
3) 10 +
Settlement
0) none
1) hamlet
2) village
3) town or city
Extent of Private Ownership
0) none
1) < 10%
2) 11 - 50%
3) 51% +
Petroleum Operations
0) none
1) one
2) several
3) many
Pipelines or Utility Lines
0) none
1) minor
2) moderate
3) major
Institutional Facility
0) none
1) minor
2) moderate
3) major

Public and Community Buildings
0) none
1) one
2) two
3) 3 or more
Public Recreation Facility
0) none
1) minor
2) moderate
3) major
Recreation Activities
0) none
1) extensive and passive
2) passive and intensive
3) active and intensive
Industry
0) none
1) minor
2) moderate
3) major
Commercial
0) none
1) minor
2) moderate
3) major
Gravel Excavation
0) none
1) small or abandoned
2) active but moderate
3) major
River Development
0) none
1) pump
2) wier
3) dam
Other Developments
0) none
1) unobstrusive
2) conspicuous
3) dominant

CANOEABILITY POTENTIAL

Navigability
0) not navigable
1) barely navigable
2) moderately navigable
3) entirely navigable
Ease of Paddling
0) not paddleable
1) novice
2) itermediate
3) expert
Hazards
0) none
1) one
2) several
3) continuous
Nature of Hazards
0) none
1) too shallow
2) difficult water
3) rocks and falls
Degree of Risk *
Portages
0) none
1) easy
2) major
3) difficult
Difficulty Paddling Upstream
0) impossible (insufficient water)
1) easy
2) moderately difficult
3) very difficult

Logjams or Floating Hazards
0) none
1) one
2) few
3) several
Channel Rocks
0) none
1) few
2) several
3) many
Rapids
0) none
1) one
2) several
3) many

Waterfalls
0) none
1) one
2) two
3) 3 or more
Paddler Appeal *
Potential Campsites (No. + Quality)
0) none
1) unattractive
2) adequate
3) excellent

SUBSURFACE
Natural Gas Potential *
Oil Potential *

Coal Potential *
Groundwater Probability *
Gravel Potential *

Where no magnitude values are listed, * means the four values are respectively none, low, moderate, and high.

Where a # appears after the characteristic, the magnitude values are none, trace, apparent and prominent.

Clockwise from upper left:

1. Secluded sites are preferred for cottages.
2. A tranquil stream and healthy flora provide ideal habitat for ungulates.
3. Mature spruce trees on flat floodplains provide appealing sites for campgrounds.
4. The shorelands are delicate and should remain in their natural condition.

These decisions are determined in advance of the inventory and are constant irrespective of the unit being considered. This means that the only parameter that needs to be determined for each characteristic is its magnitude. The completed matrix contains all the data gathered for each unit and it constitutes the single most important source of information available for future examination.

When the magnitude values are translated to the appropriate form of expression position (+, -, or zero), they can be totalled. The results are presented on the Form of Expression matrix which is Figure 9a. Totals are given for the valley portion of the unit separately from the upland portion. These totals should be regarded as ratings of quantitative supply for each form of expression.[13]

THE EVALUATION

5. Knowing the Nature and Extent to Which a Landscape Expresses Itself, it is Possible to Determine the Suitability of Each Unit for Various Types of Landscape Experience (Use).

The goal in carrying forward this Study is to produce a plan that promotes the highest quality of experience (or use) at each site, while at the same time protecting the integrity of the river resources. Once having identified its inherent qualities, its important and irreplaceable assets, the next step is to consider uses which are unique to the river and are not duplicatable outside its influence. Thereafter we consider uses which are dependent on the resource base generally and which are mutually compatible with each other and the integrity of the landscape. Before proceeding with this evaluation however, it is important to recognize that the natural resources of the river are limited, that any human use alters their state, and that such use should occur in a manner which achieves the best fit between the resource and its use, thus diminishing the resource to the least while satisfying the user/use to the greatest degree. Generalized evaluations are made by determining the relationship between each form of expression so that totals that group values under general types of experience can be derived. Six general types of experience are presented in this evaluation. They are preservation, passive recreation, agriculture, extensive economic activity, and intensive use.

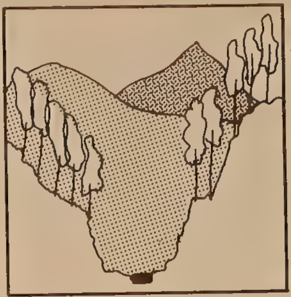
BASIC ASSUMPTIONS

The following assumptions are vital to this evaluation.

1. By understanding the characteristics and qualities necessary for each type of experience (or use), those river segments which contain the highest number and intensity of the characteristics and qualities which are appropriate for a particular type of experience or use become the most suitable segments for that experience or use.

2. Since preservation sites are the most susceptible to disturbance and represent the river in its purest form, they should be selected first, pre-empting all other potential uses. From the remaining segments, areas can be chosen for recreation, agriculture, industry, economic activity, etc.

3. Each segment of the river represents a distinct sphere of experiences and opportunities and so it should be analyzed for its ability to provide for a range of uses, so then, the best available units must be searched out and an attempt made to designate sites for both preservation and more intensive uses.



This not comparable to this

4. Each type of channel pattern along a river is distinct from other patterns in its capacity to provide experiences or serve needs. No direct comparison should be made of use potentials between units in different channel pattern locations.

5. The Riverscape is an inseparable entity all linked together as a continuous corridor along the river. So after designating locations for various preferred uses adjacent units which can be used for compatible uses should be grouped into complexes.

6. River shorelands possess a depletable supply of resources. The most appropriate approach for assigning uses to these resources is to select use categories which express impact. The principle interest here is the limits to which a given area can be used for specific purposes and intensities of use without either immediate or long term deterioration. To this end it is necessary to express each use according to the stress it will bring to a landscape.

7. The appropriateness of any specific activity must be considered in its proper perspective as it relates to management, planning, maintenance and jurisdictional controls.

PUBLIC INVOLVEMENT

During the earliest preparations for this Study all involved agencies urged a program of public participation. As a result efforts were made to inform the relevant population and solicit their input. Several avenues were followed in carrying this out. (See Appendix D).

The Media

Most of the newspapers and the television stations broadcasting and reporting in the vicinity of the Little Red Deer River were periodically informed of all planning activities. A news release was issued announcing the initiation of the Study and all public meetings were advertised through these media. C.K.R.D. radio hosted a one hour broadcast of its, "Open Line" program with the study planner as the morning guest. The Red Deer Advocate newspaper carried a half page feature on the Little Red Deer and several short reports were published or broadcast following personal interviews with the planning staff.

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[13] A constant value of 100 was added to each value to eliminate negative totals.

MAGNITUDE OF RIVER CHARACTERISTICS

River Characteristics / Form of Expression		Streamway																																																															
		Esthetic Facters												Environmental Facters										Hydrological Factors																			Biologic Factors									Geomorphic Factors											Use				
		Visual Diversity	Visual Confinement	Visual Response	Availability of Vistas	Clarity of Edge	Complexity of Edge	Dominant Nat. Features	Complexity of Nat Features	Visual Integrity	Pristineness	Recoverability	Missfits	Physiochemical Water Quality	Biological Water Quality	Water Colour and Clarity	Wading and Swimming	Water Pollution	Debris or Litter	Offensive Odors	Livestock and Farm Wastes	Industrial Wastes	Domestic Wastes	Normal Summer Flow	Variability of Annual Flow	Width of Streamway	Average Depth of Water	Velocity of Flow	Tributaries	Pools and Riffles	Navigability	Ease of Paddling	Hazards	Nature of Hazards	Degree of Risk	Portages	Difficulty Paddling Upstr.	Logjams or Floating Haz.	Channel Rocks	Rapids	Waterfalls	Paddler Appeal	Angling Success	Variety of Fish Species	Spawning Areas	Water Plant Diversity	Waterfowl Species	Water Mammels	Algae Growth	Tree Cover on Islands	Shoreline Vegetation	River Pattern	Gradient	Bed Material	Bank Material	Bank Heights	Sand Bars (No.+% of shore)	Steep Banks (No.+% of shore)	Deposition of Sediments	Islands in Channel	Bank Instability	Slump Features	Livestock Watering	Vehicle Crossing	River Developments	Other Developments	Type of Boat Use
Uniqueness		+					+	+			+			+	+									+									+			+				+	+		+	+	+		+						+			+		+		+							+
Diversity		+				+	+		+								+								+			+	+	+			+	+		+	+	+	+	+	+		+	+		+	+	+		+	+	+					+	+		+							
Fragility																																													+				+					+	+			+	+		+	+					
Seclusion			+			+																				-																								+	+					+		+		+							
Sensuality				+	+					-			-			-	+	-	-	-	-	-	-					+	+		+	+			+					+	+	+							-																		
Seasonality																	+								+			+				+					+					+	+			+	+		+		+																
Paddlebility																								+		+	+				+	+										+																									+
Cultivability																																																																		
Resource Capability																																																														+				
Site Developability																																																												-	-					
Existing Development												+																																																	+	+	+	+	
Riverscape Units	A·1	1	2	2	1	3	2	2	1	1	2	2	0	-	-	2	0	0	0	1	2	0	0	1	3	2	2	2	0	2	1	1	0	1	1	0	2	0	1	0	0	1	1	2	0	1	2	2	0	0		2	1	1	1	3	6/1	2/1	1	0	2	1	2	1	0	0	2
	A·2	3	3	2	1	3	1	1	1	1	2	2	0	-	-	2	0	0	0	0	1	0	0	1	3	2	2	1	1	2	1	1	0	0	1	0	1	0	1	0	0	1	1	2	0	-	2	2	-	1		2	1	1	3	2	4/1	3/1	1	1	3	0	2	0	0	0	2
	B·1	1	2	2	1	2	2	1	1	1	2	2	0	-	-	1	2	0	0	0	1	0	0	1	3		1	1	0	1	1	1	0	0	1	0	1	0	0	0	0	1	1	1	0	-	2	2	0	0		2	1	1	3	2	5/1	4/2	1	0	2	1	1	1	1	0	2
	B·2	1	2	1	1	2	1	1	0	1	2	1	0	-	-	1	1	0	0	0	0	0	0	1	3	2	1	1	0	2	1	1	0	0	1	0	1	0	0	0	0	1	1	1	0	-	2	1	-	0		2	1	1	3	2	6/2	2/1	0	0	2	1	1	1	1	0	2
	B·3	1	1	1	1	2	1	1	1	1	2	1	-	-	-	1	1	0	0	0	0	0	0	1	3	2	1	1	0	2	1	1	0	0	1	0	1	0	0	0	0	1	1	1	0	-	2	1	-	3		2	1	1	3	2	2/1	1/1	-	1	2	-	1	0	0	0	2
	C·1	1	1	1	0	2	1	0	0	1	2	1	0	-	-	3	0	0	0	0	0	0	0	1	3	2	2	1	0	2	2	1	0	0	0	0	1	0	0	0	0	1	0	1	0	-	2	2	-	-		2	1	1	3	3	0	1/2	2	0	2	2	0	0	0	0	2
	C·2	2	2	1	1	2	2	0	0	1	3	3	0	-	-	2	1	0	0	0	0	0	0	1	3	2	2	1	2	2	2	1	0	0	0	0	1	0	0	0	0	2	0	1	0	-	2	2	-	-		2	1	1	3	2	4/2	1/1	2	0	2	1	0	0	0	0	2
	C·3	2	2	1	1	2	2	0	0	1	3	3	0	-	-	2	0	0	0	1	1	0	1	1	3	2	2	1	2	2	2	1	0	0	0	0	1	0	1	0	0	1	0	1	0	-	2	2	-	-		2	1	1	3	2	10/2	10/1	2	0	2	1	2	1	0	0	2
	C·4	2	2	3	1	2	2	1	1	1	3	3	0	-	-	2	3	1	2	0	0	0	1	1	3	2	2	1	1	2	2	1	0	0	0	0	1	0	1	0	0	1	0	1	0	-	2	2	-	0		2	1	1	3	1	4/2	0	1	0	2	2	0	0	0	0	2
	D·1	1	2	1	0	2	2	0	0	1	2	1	1	-	-	1	0	1	0	0	0	0	0	1	3	2	2	1	1	2	1	1	0	0	0	0	1	0	1	0	0	1	0	1	0	-	2	2	-	0		2	1	1	3	2	5/1	2/1	1	0	2	1	2	0	0	0	2
	E·1	1	1	1	0	1	1	0	0	1	1	2	0	-	-	2	2	2	0	1	1	0	1	1	3	2	1	1	0	1	1	1	0	0	0	0	1	0	0	0	0	1	0	1	0	-	2	1	-	0		2	1	3	3	1	0	0	2	0	2	0	1	1	1	0	2
	E·2	1	1	1	0	1	1	0	0	1	1	1	0	-	-	1	1	1	0	0	2	0	0	1	3	2	1	1	0	1	1	1	0	0	0	0	1	0	0	0	0	1	0	1	0	-	2	1	-	0		2	1	3	3	2	0	2/1	1	0	1	1	2	0	0	0	2
	E·3	1	1	1	0	2	2	0	0	1	2	2	0	-	-	1	0	1	0	0	1	0	0	1	3	2	1	1	2	1	1	1	0	0	0	0	1	0	1	0	0	1	0	1	0	-	2	1	-	0		2	1	3	3	2	1/1	1/2	1	1	1	1	2	0	0	0	2
	E·4	1	1	0	0	1	1	0	0	1	2	2	1	-	-	1	0	1	0	0	1	1	0	1	3	2	1	1	2	1	1	1	0	0	0	0	1	0	1	0	0	1	0	1	0	-	2	1	-	0		2	1	3	3	2	2/1	1/1	2	0	2	2	2	0	0	0	2
	F·1	2	2	2	0	2	2	0	0	1	2	1	0	-	-	1	0	1	0	0	2	0	0	1	3	2	1	1	1	1	1	1	0	0	0	0	1	0	1	0	0	1	0	1	0	-	2	1	-	0		2	1	3	3	2	3/1	2/2	1	0	2	1	2	0	0	0	2
	F·2	1	1	1	0	2	1	0	0	1	2	1	0	-	-	1	1	1	0	0	2	0	0	1	3	2	1	1	3	2	1	1	0	0	0	0	1	0	1	0	0	1	0	1	0	-	2	1	-	0		2	1	3	3	2	4/2	1/1	1	0	2	1	2	0	1	0	2
	G·1	2	2	1	1	2	1	0	0	1	2	1	0	-	-	1	0	1	0	0	0	0	0	1	2	2	1	1	0	3	1	1	0	0	0	0	1	1	0	0	0	1	0	1	0	-	2	1	-	0		2	1	3	3	2	3/1	0	2	0	2	4	1	0	0	0	2
	G·2	2	3	2	1	3	2	0	0	2	2	2	0	-	-	1	0	1	0	0	0	0	0	1	2	2	1	1	1	2	1	1	0	0	0	0	1	0	0	0	0	1	1	1	0	-	2	1	-	0		2	1	3	3	3	2/1	4/2	1	0	2	2	1	0	0	0	2
	H·1	3	3	3	2	3	2	0	0	1	2	1	0	-	-	1	1	1	0	0	0	0	1	1	2	2	2	2	0	3	1	1	1	1	1	0	2	1	2	0	0	1	1	1	0	-	2	1	-	0		4	2	2	1	2	0	2/2	0	0	2	2	0	0	0	0	2
	H·2	2	3	3	2	3	2	2	2	1	2	1	1	-	-	1	1	1	1	1	1	0	1	1	2	2	2	2	0	3	2	2	2	1	1	0	1	0	2	0	0	1	1	1	0	0	2	1	-	0		4	2	2	3	1	0	3/1	0	0	1	1	1	0	0	0	2
	H·3	1	2	1	1	2	1	0	0	2	1	2	1	-	-	2	0	2	0	1	0	1	1	1	2	2	1	1	0	1	1	1	0	0	0	0	1	0	0	0	0	1	0	1	0	0	2	1	-	0		2	1	3	3	1	4/1	1/1	1	1	1	2	1	0	1	0	2
	I·1	2	2	1	1	2	1	0	0	2	1	1	1	-	-	1	3	1	2	0	0	0	2	1	2	2	1	1	1	2	1	1	0	0	0	0	1	0	0	0	0	1	1	1	0	0	2	1	-	0		2	1	3	3	1	1/1	1/1	1	1	1	1	1	0	1	0	2
	I·2	1	0	1	1	1	0	0	0	1	1	2	0	-	-	2	0	1	0	1	1	0	0	1	2	2	2	1	1	1	2	1	0	0	0	0	1	0	0	0	0	2	0	1	0	0	1	0	0	0		1	1	3	3	1	0	0	0	0	1	0	2	0	0	0	2
	I·3	2	1	2	1	2	2	1	1	1	2	2	0	-	-	2	0	0	0	1	1	0	0	1	2	2	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0	1	0	0	2	1	1	0		2	1	3	3	2	4/1	0	1	0	2	0	2	0	0	0	2
	I·4	2	1	1	1	1	2	1	1	1	1	2	2	-	-	2	0	2	1	1	1	1	0	1	2	2	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0	1	0	0	1	1	2	0		2	1	3	3	2	3/1	0	1	0	2	0	2	0	0	0	2
	J·1	2	1	0	1	1	2	1	2	2	1	2	3	-	-	2	1	2	2	2	3	2	0	1	2	2	1	1	2	1	1	1	1	3	0	1	1	0	0	0	0	1	0	1	0	0	1	1	2	0		2	1	3	3	2	0	0	1	0	2	0	3	0	2+1	0	2
	K·1	2	2	1	1	2	2	1	1	1	2	1	0	-	-	1	1	1	0	0	1	0	0	1	2	2	1	1	4	2	1	1	1	3	0	1	1	0	0	0	0	2	1	1	0	0	2	1	2	0		2	1	3	3	2	6/2	0	1	0	2	0	1	0	2	0	2
	K·2	1	1	1	1	1	1	0	0	1	2	1	1	-	-	1	1	1	0	0	1	0	1	1	2	2	1	1	1	1	1	1	0	0	0	0	1	0	1	0	0	1	1	1	0	0	2	1	1	0		2	1	3	3	2	2/1	0	0	0	2	0	2	0	0	0	2
	K·3	2	2	2	1	2	2	1	1	1	2	1	0	-	-	1	0	2	0	1	1	0	2	1	2	2	1	1	2	2	1	1	0	0	0	0	1	0	1	0	0	1	1	1	1	0	2	1	2	0		2	1	3	3	2	4/1	0	1	0	2	0	2	0	0	0	2
	K·4	1	1	1	1	1	1	1	1	1	2	1	0	-	-	1	0	0	0	0	1	0	0	1	2	2	1	2	1	2	1	1	0	0	0	0	1	0	1	0	0	1	1	1	1	0	2	1	0	0		2	1	3	3	2	3/1	0	1	0	1	0	2	0	1	0	2
	K·5	2	2	2	1	2	2	1	1	1	3	0	1	-	-	0	1	0	0	0	1	0	0	1	2	2	1	2	1	2	1	1	2	1	0	0	1	0	1	0	0	1	1	1	1	0	2	1	0	0		2	1	2	3	2	1/1	0	1	0	1	1	2	0	0	0	2
	L·1	1	1	2	1	1	1	1	1	1	2	1	1	-	-	0	0	0	0	0	1	0	0	1	2	2	1	2	2	2	1	1	2	1	0	0	1	0	1	0	0	1	1	1	1	0	1	1	0	0		4	1	2	3	2	2/1	1/1	1	0	1	1	2	0	0	0	2
	L·2	2	2	2	2	2	2	1	1	1	2	1	1	-	-	0	2	0	1	0	1	0	1	1	2	2	1	2	2	2	1	1	2	1	0	0	1	1	1	0	0	1	1	1	1	0	1	1	0	0		4	1	2	3	2	3/1	3/2	1	0	1	1	2	0	0	1	2
	M·1	2	2	2	1	2	1	0	0	1	2	0	1	-	-	0	0	0	0	0	1	0	0	1	2	2	1	2	2	2	1	1	2	1	0	0	1	1	2	0	0	1	1	1	1	0	1	1	0	0		4	1	2	3	2	1/1	1/1	1	0	2	1	2	0	0	0	2
	M·2	2	2	2	1	2	1	0	0	2	2	1	2	-	-	0	2	0	1	0	1	0	0	1	2	2	1	2	2	2	1	1	2	1	0	0	1	1	2	0	0	1	1	1	1	0	1	1	0	3		4	1	2	3	2	2/1	2/1	1	1	2	1	2	0	0	0	2
	N·1	2	2	2	2	2	1	0	0	1	2	1	0	-	-	0	0	0	0	0	1	0	0	1	2	2	1	2	2	2	1	2	3	1	0	0	0	-	-	0	0	1	1	1	1	-	-	1	-	0		2	2	2	1	2	1	3/1	2	0	2	1	2	1	0	0	0
	N·2	2	2	2	2	2	1	1	1	1	2	1	0	-	-	1	0	0	0	0	1	0	0	1	3	1	1	2	3	3	1	2	2	1	0	0	0	0	1	0	0	0	2	1	2	-	-	1	-	0		2	2	2	2	2	0	3/1	1	0	2	1	2	2	0	0	0
	O·1	2	2	3	3	2	2	1	1	1	3	0	1	-	-	1	0	0	0	0	1	0	0	1	2	1	1	1	2	2	0	0	2	1	0	0	0	3	0	0	0	0	2	1	2	-	-	1	-	-		2	2	3	2	1	0	0	2	0	2	1	2	1	0	0	0
	P·1	3	2		3	3	3	2	1	0	3	0	0	3	3	0	0	0	0	0	0	0	0	1	3	1	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	-	-	-	-	0		3	3	2	3	1	0	0	0	0	2	0	1	0	0	0	0
	Q·1	2	3	3	2	2	2	1	1	0	3	0	0	3	3	1	0	0	0	0	0	0	0	1	2	1	1	1	2	2	0	0	2	1	0	0	0	2	0	0	0	0	2	1	2	-	-	1	-	-		2	2	3	2	1	0	3/1	1	0	2	1	1	2	0	0	0
	Q·2	1	1	2	2	1	1	1	1	1	2	1	1	3	3	1	0	0	0	0	1	0	0	1	2	1	1	1	3	2	0	0	0	0	0	0	0	2	0	0	0	0	2	1	2	-	-	1	-	-		2	2	3	3	1	0	1/0	1	0	2	0	2	2	0	0	0
	R·1	1	1	1	2	1	1	0	0	0	3	0	0	3	3	1	0	0	0	0	0	0	0	1	2	1	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	-	-	1	-	0		2	2	3	3	1	0	0	0	0	2	0	2	1	0	0	0
	R·2	2	2		2	2	2	1	1	3	3	0	1	3	3	0	0	0	0	0	0	0	0	1	2	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	-	-	1	-	0		2	2	3	3	1	0	0	0	0	2	1	1	1	0	0	0
	S·1	2	2	1	3	2	2	0	0	1	3	0	1	3	3	0	0	0	0	0	0	0	0	1	2	1	1	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	-	-	1	-	0		2	2	1	1	1	0	0	0	0	2	0	1	2	0	0	0

Figure 8a

MAGNITUDE OF RIVER CHARACTERISTICS

Valley Floor and Sides

River Characteristics / Form of Expression	Esthetic Factors															Environmental Factors								
	Visual Diversity	Visual Confinement	Visual Response	View of River	Natural Open Space	Clarity of Valley Side Edge	Potential Campsites (No+Score)	Natural Disfigurements	Dominant Nat Features	Complexity of Nat Features	Visual Integrity	Pristineness	Recoverability	Sense of Place	Missfits	Presence of Litter	Frequency of Littering	Difficulty to Clean-Up	Offensive Odors	Noise	Livestock and Farm Wastes	Industrial Wastes	Domestic Wastes	Natural Shelter
Uniqueness						+	+	−	+			+		+										
Diversity	+			+	+	+	+			+														
Fragility								+																
Seclusion		+												+										+
Sensuality			+	+							−			+	−	−	−	−	−	−	−	−	−	
Seasonality																								
Paddlebility																								
Cultivability																								
Resource Capability																								
Site Developability													+											
Existing Development																+					+	+	+	
Riverscape Units																								
A·1	2	2	2	3	1	2	2/2	0	1	1	2	2	2	2	0	0	0	0	1	0	1	0	0	3
A·2	2	2	2	2	1	3	2/2	0	3	2	2	2	1	2	1	0	0	0	0	0	0	0	0	3
B·1	2	2	1	2		3	2/2	0	2	1	2	1	1	1	0	0	0	0	0	0	0	0	0	2
B·2	2	2	2	2		3	1/2	0	2	2	2	1	1	2	0	0	0	0	2	0	0	0	0	1
B·3	2	1	2	2		2	1/3	0	2	2	2	1	1	1	0	0	0	0	1	0	0	0	0	2
C·1	1	1	1	2		2	0	0	1	1	2	1	1	1	0	0	0	0	0	0	0	0	0	2
C·2	2	3	2	1		1	1/3	1	3	2	3	2	2	3	3	2	2	1	0	0	0	0	0	2
C·3	2	2	2	2		2	1/2	0	3	2	2	2	2	1	2	0	0	0	1	0	1	0	0	2
C 4	2	2	2	1		2	5/3	0	1	1	1	2	2	2	0	1	2	1	0	1	0	0	1	2
D·1	2	2	1	2		1	5/2	2	2	1	1	2	1	1	1	0	0	0	0	0	0	0	0	2
F·1	1	1	1	3		3	0	0	2	2	1	1	3	1	0	1	1	1	1	0	1	0	1	2
F·2	1	0	1	3		3	0	0	0	0	1	1	2	1	3	0	0	0	1	0	2	0	0	2
F·3	2	2	2	1		1	2/2	0	0	0	1	2	2	2	0	0	0	0	0	0	2	0	0	2
F 4	1	1	1	3		1	1/1	2	0	0	3	1	3	1	3	1	2	2	0	2	1	1	0	1
F·1	1	1	1	2		3	1/3	1	1	1	2	1		1	0	0	0	0	0	1	1	1	0	1
F·2	1	1	1	2		3	2/2	1	1	1	2	1	3	1	0	0	0	0	0	0	1	0	0	1
G·1	2	1	2	2		1	0	1	0	0	3	1	3	2	2	1	1	1	0	1	1	2	0	2
G·2	1	1	1	3		2	1/2	0	0	0	1	1	2	1	0	0	0	0	0	0	0	0	0	1
H·1	3	3	2	2		3	2/2	0	2	1	2	1	2	2	1	1	2	1	0	0	0	0	1	2
H·2	2	2	2	2		3	2/2	0	2	2	1	2	2	2	1	1	2	1	1	0	1	0	1	3
H·3	2	1	1	2		1	1/2	0	0	0	2	1	3	1	0	1	2	1	1	1	0	1	2	1
I·1	2	2	2	2		2	3/3	0	0	0	1	1	2	2	1	2	2	1	0	1	1	0	2	2
I·2	0	0	1	3		1	0	2	2	2	2	0	3	1	0	0	0	0	1	0	1	0	0	0
I·3	2	1	3	3		1	3/2	0	2	1	1	3	3	2	1	0	0	0	0	1	1	1	0	3
I·4	1	1	1	2		1	2/2	1	2	2	3	1	3	1	2	1	2	2	1	0	1	1	0	2
J·1	2	1	1	2		1	4/2	1	1	2	3	1	3	1	3	1	2	1	2	1	3	1	0	2
K·1	2	2	2	2		3	4/2	1	1	1	1	2	1	2	2	1	1	1	0	0	1	1	0	3
K·2	1	1	1	3		3	0	0	0	0	2	1	3	1	2	1	1	1	2	1	2	0	0	1
K·3	2	2	2	2		2	2/2	0	1	1	1	2	1	2	0	0	0	0	0	0	1	0	0	2
K 4	1	1	1	3		2	1/2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1
K 5	2	2	2	2		3	1/1	0	1	1	2	3	0	2	2	2	1	2	0	0	1	0	3	3
L·1	1	1	1	2		1	1/2	0	1	1	2	2	2	1	1	0	0	0	0	0	1	0	0	1
L·2	2	2	2	3		3	2/3	0	2	1	2	2	1	2	1	2	2	1	0	0	1	0	2	1
M·1	2	2	2	2		1	1/2	0	1	1	2	2	1	1	1	0	0	0	0	0	1	0	0	2
M·2	2	2	1	2		1	3/2	0	1	1	2	1	2	2	3	1	2	1	0	1	1	0	1	2
N·1	2	2	2	2		1	1/2	0	1	1	1	2	1	1	0	0	0	0	0	0	1	0	0	3
N·2	2	1	2	3		2	1/1	1	2	1	3	1	2	1	0	0	0	0	0	0	1	0	0	2
O·1	3	2	2	3		1	0	0	2	1	1	3	0	2	1	0	0	0	0	0	0	0	0	3
P·1	3	3	3	1		3	2/2	0	0	2	3	3	0	3	0	0	0	0	0	0	0	0	0	3
Q·1	3	2	3	3		1	0	0	2	1	0	3	0	2	0	0	0	0	0	0	0	0	0	3
Q·2	2	1	2	3		1	0	0	0	0	1	2	2	1	1	0	0	0	0	0	1	0	0	1
R·1	0	0	1	3		0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	1	0	0	1
R·2	2	3	1	1		3	2/2	0	1	1	0	3	0	2	0	0	0	0	0	0	0	0	0	3
S 1	2	2	2	3		2	0	0	2	2	0	2	1	2	1	0	0	0	0	0	1	0	0	3

River Characteristics / Form of Expression	Biologic Factors										Geomorphic Factors																								
	Amount of Tree Cover	Height of Trees	Diversity of Vegetation	Condition of Vegetation	Natural Forage	Upland Bird Species	Small Animal Species	Large Animal Species	Extent of Habitat	Quality of Habitat	Terraces	Amount of Floodplain	Swamps, Bogs, Marsh	Offstream Water Bodies	Riverine Process Features	Width of Valley Floor	Valley Floor Topography	Valley Floor Parent Material	Valley Floor Soil Drainage	Valley Floor Soil Type	Valley Floor Productivity	Valley Floor Erosion	Valley Floor Instability	Mud Flats	Width of Valley	Valley Side Height	Valley Side Slope	Valley Enclosure	Valley Side Topography	Valley Side Parent Material	Valley Side Drainage	Valley Side Soil Type	Valley Side Productivity	Valley Side Erosion	Valley Side Instability
Uniqueness	+			+	+	+		+	+	+	+			+	+											+		+							
Diversity	+	+	+			+	+	+			+		+	+	+		+									+		+							
Fragility						+							+	+			+					+	+	+			+			+				+	+
Seclusion																	+								−	+	+	+							
Sensuality																						−		−				+						−	
Seasonality																																			
Paddlebility			+																																
Cultivability											+							+	+	+	+	−	−	−			−		−		+	+	+	−	−
Resource Capability	+	+																																	
Site Developability											+	+	−	−	−	+	−		+			−	−	−	+		−		−		+			−	−
Existing Development																																			
Riverscape Units																																			
A·1	3	2	2	2	1	1	1	1	3	2	3	2	0	0	0	1	1	1	3	1	2	1	2	2	2	2	3	2	2	2	3	1	2	2	2
A·2	2	2	1	3	1	1	1	1	2	3	3	3	0	0	0	3	1	1	3	1	2	0	1	0	2	3	3	2	2	2	3	2	2	1	3
B·1	2	2	2	3	1	1	1	1	2	2	3	3	0	0	2	3	1	1	3	1	2	1	1	0	3	2	3	2	1	2	3	2	2	1	2
B·2	2	2	2	2	1	1	1	1	2	2	3	3	2	0	2	3	1	1	3	1	3	0	1	0	2	2	3	1	2	2	3	3	3	1	1
B·3	1	2	2	2	1	1	1	1	2	1	3	3	0	0	2	3	1	1	3	1	3	0	1	0	3	2	3	2	2	2	3	3	3	2	1
C·1	2	2	2	2	1	1	1	1	2	2	1	3	0	0	0	3	1	1	3	1	2	2	2	-	3	2	2	2	1	1	3	1	2	1	2
C·2	3	3	3	3	1	1	1	1	2	2	2	3	3	3	3	3	2	1	1	2	1	1	2	1	3	2	2	1	1	1	3	1	2	1	2
C·3	2	2	2	3	1	1	1	1	2	2	3	2	1	0	2	2	2	1	3	1	2	1	1	2	3	2	3	1	1	1	3	1	2	1	2
C 4	3	3	3	3	1	1	2	2	2	2	1	2	0	0	0	3	2	1	3	1	2	1	1	2	3	2	1	1	1	1	3	1	2	1	1
D·1	2	2	2	3	2	2	1	2	2	2	3	0	0	2	2	3	1	1	3	1	2	2	1	2	2	2	1	1	1	1	3	1	2	2	2
F·1	1	2	2	2	2	1	1	1	3	2	2	0	0	3	2	3	1	1	3	1	2	1	1	0	3	3	3	1	1	1	3	1	2	1	1
F·2	1	2	1	2	1	1	1	1	1	1	2	3	0	0	0	3	0	1	3	1	2	1	1	0	3	2	2	1	0	1	3	1	2	1	1
F·3	3	3	2	3	2	1	1	1	2	2	1	2	0	0	1	3	1	1	3	1	1	1	1	0	3	2	2	1	1	1	3	1	2	2	1
F 4	1	2	1	1	1	2	1	1	1		1	2	2	2	2	3	1	1	2	1	2	2	2	0	3	2	3	1	1	1	3	1	2	3	2
F·1	2	3	1	3	2	1	1	1	1	2	2	2	0	0	1	3	1	1	2	1	2	1	1	0	3	2	2	1	1	2	2	1	2	1	1
F·2	2	2	1	3	1	1	1	1	2	1	2	0	0	0	1	3	1	1	2	1	2	1	1	0	3	2	2	1	1	2	2	1	2	1	1
G·1	2	2	2	2	1	1	2	1	3	3	2	2	0	0	2	3	2	1	3	1	1	2	3	0	3	2	1	1	2	1	3	2	1	2	2
G·2	1	2	1	2	1	1	1	1	1	1	2	3	0	0	0	3	1	1	3	1	2	1	1	0	2	2	2	1	1	2	3	1	2	2	2
H·1	2	3	2	3	2	1	1	1	1	2	2	1	0	0	0	2	1	1	3	1	2	1	1	0	2	3	3	2	2	1	3	1	1	2	3
H·2	2	3	2	3	1	1	1	1	2	2	2	2	0	0	2	2	1	1	3	1	2	1	1	0	3	3	2	2	2	2	3	2	1	3	3
H·3	1	2	2	2	1	1	1	1	1	1	1	2	0	0	1	3	1	1	3	1	3	1	2	0	3	2	2	1	2	2	3	3	3	1	2
I·1	2	2	2	3	1	1	1	1	2	2	2	2	2	2	1	3	1	1	3	1	2	1	1	0	3	2	2	1	2	2	3	2	2	1	1
I·2	0	0	0	0	1	1	1	1	1	1	0	0	2	3	2	3	1	2	3	1	2	2	2	0	3	1	1	0	1	2	3	3	2	2	2
I·3	3	2	2	3	1	1	1	1	3	3	0	1	0	0	1	3	3	2	3	1	2	1	3	0	3	3	2	1	2	2	3	3	2	3	3
I·4	2	2	2	2	1	1	1	1	1	1	1	1	2	3	2	3	1	1	3	1	2	2	2	0	3	1	1	0	1	2	3	3	2	2	2
J·1	2	2	2	2	1	1	1	1	1	2	1	3	2	2	2	3	1	1	3	1	2	2	2	0	3	1	1	0	1	2	3	2	2	2	2
K·1	3	2	2	3	1	1	1	1	2	3	2	2	1	0	2	3	1	1	3	1	2	1	2	0	3	2	2	1	2	2	3	2	2	3	3
K·2	1	2	1	2	1	1	1	1	1	1	2	3	0	0	1	3	0	1	3	1	2	0	1	0	2	2	2	1	2	2	3	2	1	2	2
K·3	3	2	2	3	2	2	2	2	3	3	1	2	0	0	1	3	1	1	2	1	2	1	1	0	2	3	2	2	2	2	2	2	1	2	2
K 4	1	2	2	2	2	1	1	1	1	2	1	2	0	2	1	3	1	1	2	1	2	1	2	0	3	2	2	1	1	2	3	2	1	3	3
K 5	3	2	3	2	2	1	1	1	2	3	1	2	0	0	0	3	1	1	3	1	1	0	0	0	2	3	2	1	2	2	3	2	1	3	3
L·1	2	2	2	2	2	1	1	1	2	2	1	2	2	1	2	3	1	1	3	1	1	1	1	0	2	2	2	1	2	2	3	2	1	2	3
L·2	2	2	2	2	1	1	1	1	1	1	2	2	0	0	1	3	1	1	3	1	2	0	1	0	2	3	2	1	2	2	3	2	1	2	1
M·1	3	2	2	2	3	1	1	1	3	2	1	2	2	1	2	3	1	1	3	1	1	1	1	0	2	3	2	1	2	2	3	2	1	2	3
M·2	3	2	3	2	2	1	1	1	2	2	2	2	0	0	1	3	1	1	3	1	1	1	1	0	2	3	2	2	2	2	3	2	1	2	3
N·1	3	3	2	3	2	1	1	2	2	2	2	2	0	0	3	3	1	1	3	1	2	1	1	0	2	3	2	2	2	2	3	2	1	2	3
N·2	2	3	2	3	1	1	1	2	3	3	1	3	0	0	0	3	1	1	3	1	2	1	2	0	3	3	2	2	2	2	3	2	2	1	2
O·1	3	3	3	3	3	1	1	2	3	3	1	3	1	0	3	3	2	1	2	1	1	1	2	0	3	3	2	2	2	2	2	2	1	3	2
P·1	3	3	3	3	1	1	1	2	3	2	0	0	1	0	0	1	3	0	3	2	1	2	2	0	2	3	3	2	3	2	2	2	1	2	3
Q·1	3	3	3	3	3	1	1	2	3	3	1	2	0	0	1	2	2	1	2	1	1	2	2	0	3	2	2	2	2	2	2	2	1	3	2
Q·2	1	2	1	2	2	1	1	2	3	2	2	3	1	1	1	3	1	1	2	1	1	2	2	0	3	2	2	1	1	2	2	2	1	2	2
R·1	1	1	1	1	1	1	1	3	3	3	0	3	1	2	1	3	2	1	3	1	1	1	2	0	3	2	2	1	2	2	3	2	1	2	2
R·2	3	3	2	3	3	1	1	3	3	2	0	1	0	0	1	1	2	1	3	1	1	1	2	0	2	3	2	2	2	2	3	2	1	2	2
S 1	3	2	3	3	2	1	1	3	3	3	1	2	2	2	1	3	1	1	2	1	1	1	3	0	2	3	2	2	2	1	2	2	1	2	2

River Characteristics / Form of Expression	Development Factors																								
	Archeological Sites	Historical Sites	Access to River	Roadway	Feasability of building Road	Extent of Clearing	Recent Clearing	Amount Cultivated	Agricultural Crops	Extent of Private Ownership	Livestock Grazing	Farm Buildings	Petroleum Operation	Pipelines	Utility Lines	Institutional Facility	Public Recreation Facility	Recreation Activities	Gravel Excavations	Industry	Commercial Facility	Residential	Public and Community	Settlement	Other Development
Uniqueness	+	+																							
Diversity																	+	+							
Fragility																									
Seclusion				−																					
Sensuality							−												−						
Seasonality																									
Paddlebility																									
Cultivability								+	+			+													
Resource Capability											+		+						+						
Site Developability				+	+	+	+			+			+		+	+	+			+	+	+	+	+	+
Existing Development			+	+		+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+
Riverscape Units																									
A·1	0	0	1	1	2	1	0	1	2	3	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
A·2	0	0	1	2	2	2	0	2	2	3	2	0	0	1	0	0	0	1	0	0	0	0	0	0	0
B·1	0	0	1	1	2	2	0	2	2	3	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
B·2	0	0	1	1	2	2	0	2	2	3	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
B·3	0	0	1	2	2	3	0	2	2	3	1	0	0	0	0	0	0	2	2	0	0	0	0	0	0
C·1	0	0	1	2	2	3	0	3	2	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
C·2	0	0	1	0	2	1	0	0	0	3	0	0	0	0	0	0	0	1	2	0	0	3	0	0	0
C·3	0	0	0	0	2	2	0	2	2	3	2	2	0	0	0	0	0	1	0	0	0	0	0	0	0
C 4	0	0	2	3	3	1	0	1	2	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0
D·1	0	0	0	0	3	2	0	1	2	3	2	0	0	0	2	0	0	1	2	0	0	0	0	0	0
F·1	0	0	1	1	3	3	3	3	2	3	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
F·2	0	0	0	0	2	3	2	3	3	3	2	2	0	0	0	0	0	1	0	0	0	0	0	0	0
F·3	0	0	1	0	3	1	1	0	1	3	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
F 4	0	0	2	1	3	3	2	2	2	3	2	2	0	0	0	0	0	0	3	2	0	0	0	0	0
F·1	0	0	0	0	2	3	0	3	2	3	2	1	2	2	0	0	0	1	0	0	0	0	0	0	0
F·2	0	0	0	0	2	3	0	3	2	3	2	1	2	2	0	0	0	1	0	0	0	0	0	0	0
G·1	0	0	2	1	3	2	0	0	1	3	2	0	0	0	0	1	0	1	3	2	0	1	0	0	0
G·2	0	0	0	2	3	3	0	3	2	3	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
H·1	0	0	2	2	2	2	0	2	2	3	1	0	0	0	0	3	0	3	0	0	0	0	0	0	1
H·2	0	0	1	0	2	2	0	2	2	3	2	0	0	0	0	0	0	1	0	0	0	2	0	0	0
H·3	0	0	2	3	3	3	0	3	3	3	1	0	1	1	0	0	0	1	0	0	2	2	0	1	0
I·1	0	0	3	3	3	2	0	0	1	2	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0
I·2	0	0	3	0	3	3	0	3	2	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0
I·3	0	0	2	1	3	3	0	3	3	3	2	1	1	1	0	0	0	1	0	0	0	0	0	0	0
I·4	0	0	2	1	3	2	0	2	2	3	2	3	2	2	3	0	0	1	0	0	0	0	0	0	0
J·1	0	0	2	1	3	2	1	2	3	3	3	3	3	3	1	2	0	2	0	3	0	0	0	0	0
K·1	0	0	1	0	2	1	1	1	2	3	2	1	1	0	0	0	0	1	0	2	0	0	1	0	0
K·2	0	0	2	0	3	3	0	3	2	3	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0
K·3	0	0	0	0	2	1	1	1	2	3	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
K 4	0	0	0	0	2	3	0	2	2	3	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
K 5	0	0	1	2	2	0	0	0	1	3	2	2	0	0	0	0	0	1	0	0	0	0	0	0	0
L·1	0	0	0	0	2	2	0	1	2	3	2	0	0	2	0	0	0	1	0	0	0	0	0	0	0
L·2	0	0	1	2	2	2	2	2	2	3	2	2	0	2	0	2	2	2	0	0	0	0	0	0	0
M·1	0	1	0	0	1	1	0	1	1	3	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
M·2	0	2	3	2	3	2	1	2	2	3	2	2	0	2	0	0	2	2	0	0	0	0	0	0	0
N·1	0	0	1	1	2	2	0	2	2	3	2	3	0	0	0	1	0	1	0	0	0	1	0	0	0
N·2	0	0	2	1	2	2	0	2	2	2	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0
O·1	0	0	1	1	2	1	1	1	1	0	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0
P·1	0	0	0	1	2	0	0	0	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0
Q·1	0	0	0	0	2	0	0	0	1	1	1	2	1	0	0	0	2	1	0	0	0	0	0	0	0
Q·2	0	0	3	2	2	2	0	2	1	3	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0
R·1	0	0	1	1	2	0	0	1	1	1	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0
R·2	0	0	1	1	2	0	0	0	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0
S 1	0	0	3	1	3	0	0	0	1	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0

Figure 8b

MAGNITUDE OF RIVER CHARACTERISTICS

River Upland	Esthetic Facters															Environmental Facters									Biologic Factors									Geomorphic Factors										Development Factors																										Natural Resources					
River Characteristics / Form of Expression	Visual Diversity	Visual Confinement	Visual Response	View of River	Availability of Vistas	Natural Open Space	Clarity of Valley Break Edge	Natural Disfigurements	Dominant Natural Features	Complexity of Nat Features	Visual Intgrity	Pristineness	Recoverability	Sense of Place	Missfits	Presence of Litter	Frequency of Littering	Difficulty of Clean-Up	Offensive Odors	Noise	Livestock and Farm Wastes	Industrial Wastes	Domestic Wastes	Extent of River Expression	Amount of Tree Cover	Height of Trees	Diversity of Vegetation	Condition of Vegetation	Upland Bird Species	Small Animal Species	Large Animal Species	Extent of Habitat	Quality of Habitat	Topography	Local Relief	Slope	Parent Material	Soil Texture	Soil Type	Soil Drainage	Soil Productivity	Soil Instability	Erosion Evidence	Archeological Sites	Historical Sites	Roadway	Extent of Access	Extent of Clearing	Recent Clearing	Amount Cultivated	Agricultural Crops	Extent of Private Ownership	Farm Buildings	Livestock Confinement	Livestock Grazing	Number of Farmsteads	Petroleum Operations	Pipelines	Utility Lines	Institutional Facility	Public Recreation Facility	Recreation Activities	Gravel Excavations	Industry	Commercial Facility	Residential	Public and Community	Settlement	Other Development	Groundwater Probability	Gas Potential	Oil Potential	Gravel Potential	Coal Potential	Commercial Forest Potential
Uniqueness			+	+	+			−	+			+												+	+			+	+		+	+	+											+	+																														
Diversity	+					+	+			+														+	+	+	+		+	+	+																														+	+														
Fragility								+																					+							+	+					+	+																																
Seclusion		+												+																						+										−	−																												
Sensuality			+	+	+						−			+	−	−	−	−	−	−	−	−	−	+																			−						−					−									−												
Seasonality																											+		+			+																																												
Paddlebility																																																																											
Cultivability																																		−	−	−		+	+	+	+	−	−							+	+		+			+																				
Resource Capability																									+	+																														+		+						+							+	+	+	+	+	+
Site Developability													+																					−	−	−				+			−			+	+	+	+			+							+	+	+			+	+	+	+	+	+	+					
Existing Development																+					+	+	+																							+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+						
Riverscape Units																																																																											
A·1	1	0	1	2			3	0	2	1	1	1	3	1	0	0	0	0	0	0	1	0	0	1	1	2	1	2	2	1	1	1	1	1	1	1	2	3	3	3	3	1	1	0	0	2	2	3	0	3	3	3	0	0	2	2	0	0	0	0	0	1	0	0	0	0	0	0	0	2	1	1	1	0	0
A·2	1	1	1	3			3	0	0	0	1	1	3	2	0	0	0	0	0	0	1	0	0	1	1	2	1	2	2	1	1	1	1	1	1	1	2	2	3	3	3	1	1	0	0	2	2	3	0	3	3	3	3	2	2	2	0	1	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1	0	0
B·1	1	1	1	1			2	0	1	1	2	1	3	1	1	0	0	0	1	0	2	0	0	2	1	2	1	2	2	1	1	1	1	1	1	1	2	2	3	3	3	2	1	0	0	2	2	3	0	3	3	3	3	3	3	2	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0
B·2	1	1	1	1			2	0	1	1	2	1	3	1	2	0	0	0	2	0	2	0	0	2	1	2	1	2	2	1	1	2	1	1	1	1	2	2	3	3	3	1	1	0	0	2	1	3	0	3	3	3	3	3	3	2	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0
B·3	1	1	2	2			2	2	2	1	2	1	2	1	1	0	0	0	1	0	1	0	0	2	2	2	2	2	2	1	1	1	1	1	1	1	2	1	3	3	3	1	2	0	0	2	2	3	0	3	3	3	2	2	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2	0	0
C·1	0	0	1	1			2	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	1	1	1	1	1	1	1	2	1	3	3	3	1	1	0	0	1	1	3	0	3	3	3	2	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0
C·2	2	2	2	1			1	0	2	2	2	2	2	2	1	1	1	1	0	0	0	0	0	3	3	2	3	3	2	1	1	1	3	1	2	1	1	1	3	2	1	2	2	0	0	0	1	1	0	2	1	3	1	0	2	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	2	0	0
C·3	2	2	3	1			2	0	2	1	1	2	2	2	0	0	0	0	0	0	1	0	0	1	3	2	3	3	2	1	1	1	3	2	2	2	2	2	3	3	2	2	1	0	0	2	2	2	1	3	3	3	2	1	2	2	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2	0	0
C·4	1	1	1	1			1	1	1	1	2	1	1	1	0	0	0	0	0	1	0	0	0	3	2	2	2	2	2	2	2	2	2	1	2	1	2	1	3	3	2	2	2	0	1	3	3	3	2	3	3	3	1	0	1	1	0	0	3	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0
D·1	1	1	1	1			2	1	1	1	2	1	3	0	3	0	0	0	0	0	0	0	0	2	1	2	1	2	2	2	2	2	2	1	2	1	2	1	3	3	2	2	2	0	0	2	2	3	0	3	3	3	2	2	2	2	0	0	2	0	0	1	2	0	0	1	0	0	0	1	0	0	0	0	0
E·1	1	0	1	3			3	0	0	0	2	0	3	1	3	0	0	0	3	0	2	0	1	2	1	3	1	3	1	1	1	2	2	2	2	1	2	3	3	3	3	2	1	0	0	2	2	2	0	3	3	3	3	3	3	2	0	0	0	3	0	1	0	0	0	1	0	0	0	2	0	0	2	0	0
E·2	1	1	1	2			3	0	0	0	1	1	3	1	0	0	0	0	0	0	0	0	0	2	1	2	1	2	1	1	1	2	2	2	2	2	2	3	3	3	3	1	1	0	0	0	1	3	3	3	3	3	2	1	2	2	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	1	0
E·3	1	1	1	2			3	0	0	0	1	1	3	1	0	0	0	0	0	0	1	0	0	2	1	2	1	2	1	1	1	2	1	2	2	2	2	2	3	3	3	2	2	0	0	1	1	3	3	3	3	3	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
E·4	1	1	1	2			3	0	0	0	1	1	3	1	1	0	0	0	1	0	1	0	0	2	1	2	1	2	1	1	1	1	1	2	2	2	2	2	3	3	3	2	2	0	0	2	2	3	0	3	3	3	2	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
F·1	1	1	2	3			3	0	0	0	2	1	3	1	1	0	0	0	1	0	2	0	0	2	2	2	2	3	1	1	1	2	1	2	1	2	2	2	3	3	3	1	1	0	0	0	1	3	1	3	3	3	3	3	2	2	0	1	0	0	0	1	0	0	0	0	0	0	0	1	3	1	0	0	0
F·2	1	1	2	3			3	0	0	0	2	1	3	0	0	0	0	0	0	0	2	0	0	2	2	2	2	2	1	1	1	1	1	2	1	2	2	2	3	3	3	1	1	0	0	2	1	3	3	3	3	3	2	2	2	2	2	2	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	0
G·1	1	1	1	3			2	1	0	0	1	1	3	1	0	0	0	0	0	0	2	0	0	1	0	0	0	0	1	1	1	1	1	1	2	1	2	2	3	3	3	1	1	0	0	2	2	3	0	3	3	3	2	1	2	2	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1	0	0
G·2	1	0	1	2			2	0	0	0	1	1	3	1	0	0	0	0	0	0	1	0	0	2	1	2	1	2	1	1	1	1	1	2	2	1	2	2	3	3	3	2	2	0	0	2	2	3	0	3	3	3	3	2	2	2	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	0
H·1	2	0	2	3			3	0	1	1	1	1	3	1	0	0	0	0	0	2	0	0	0	2	1	2	1	2	1	1	1	1	1	2	2	2	2	2	3	3	3	1	1	0	0	3	3	3	0	3	3	3	3	2	2	2	0	0	0	0	0	1	0	0	0	1	0	0	0	3	3	3	0	0	0
H·2	2	1	3	2			3	0	3	2	1	1	3	2	0	0	0	0	1	1	1	0	0	2	2	3	1	3	1	1	2	2	2	2	2	2	2	2	3	3	3	2	2	0	0	3	3	3	2	3	3	3	3	2	3	3	2	1	0	0	0	1	0	0	0	0	0	0	0	1	3	3	1	0	0
H·3	1	1	1	2			1	0	0	1	1	1	3	1	1	0	0	0	0	1	1	0	2	3	1	2	2	2	1	1	1	1	1	2	2	2	2	2	3	3	3	1	1	0	0	3	3	3	2	3	3	3	2	1	2	2	2	1	0	0	0	0	0	1	0	2	1	1	0	1	3	3	1	0	0
I·1	2	1	1	2			1	0	1	1	1	1	2	1	2	1	2	1	0	1	1	0	1	2	1	2	1	1	1	1	1	1	1	1	2	1	2	2	3	3	3	1	1	0	0	3	3	3	1	3	3	3	1	1	2	1	1	1	0	0	0	0	0	0	2	2	0	0	0	1	3	3	1	0	0
I·2	1	1	1	3			0	0	1	1	1	1	3	1	1	0	0	0	0	0	2	0	0	3	1	2	2	2	1	1	1	1	1	1	2	1	2	2	3	3	3	1	1	0	0	2	3	3	2	2	3	3	2	2	3	2	1	2	0	0	0	0	0	0	0	0	0	0	0	2	3	3	1	0	0
I·3	1	1	1	3			3	0	1	1	1	1	3	1	1	0	0	0	0	0	2	1	1	3	1	2	2	2	1	1	1	1	1	1	2	1	2	2	3	3	3	1	1	0	0	2	3	0	3	3	3	3	3	2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	2	3	3	0	0	0
I·4	1	1	1	3			0	0	1	1	2	1	3	1	1	0	0	0	1	0	2	0	0	3	1	2	2	2	1	1	1	1	1	2	2	1	2	2	2	3	3	1	1	0	0	2	3	3	3	3	3	3	3	2	3	3	2	2	3	0	0	1	0	0	0	0	0	0	0	2	3	1	1	0	0
J·1	2	2	2	2			0	0	1	1	3	0	3	1	3	0	0	0	1	1	2	2	0	3	2	2	2	2	1	1	1	2	2	2	2	1	2	2	2	3	3	1	2	0	0	2	2	3	1	3	3	3	3	3	2	3	3	3	1	0	0	1	1	3	0	0	1	0	0	1	3	0	1	0	0
K·1	2	1	2	2			0	1	1	1	1	1	3	1	0	0	0	0	0	0	1	0	0	3	1	2	1	2	1	1	1	1	1	2	2	2	2	2	2	3	3	2	2	0	0	2	2	3	2	3	3	3	3	2+2	3	3	1	1	0	0	0	1	0	3	0	0	0	0	2	3	3	0	1	0	0
K·2	1	1	1	3			2	1	1	1	1	1	3	1	0	0	0	0	0	0	1	0	0	2	1	2	1	2	1	1	1	1	1	2	2	1	2	2	2	3	3	1	1	0	0	2	2	3	2	3	3	3	3	2	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	0	0
K·3	1	1	1	2			2	0	2	1	2	1	3	1	0	0	0	0	1	0	2	0	0	3	1	2	1	2	1	1	1	1	1	2	2	2	2	2	2	3	3	2	2	0	0	2	3	3	2	3	3	3	3	3	3	2	0	0	0	0	0	1	2	0	0	0	0	0	0	1	2	0	3	0	0
K·4	1	1	1	2			3	2	1	1	2	1	2	1	0	0	0	0	0	0	1	0	0	3	1	2	1	2	1	1	1	1	1	2	2	2	2	2	2	3	2	2	3	0	0	2	2	3	2	3	3	3	2	1	3	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	2	0	0
K·5	2	1	2	2			3	0	2	1	1	1	2	1	0	0	0	0	0	0	1	0	0	3	1	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	0	0	2	2	3	0	3	3	3	3	2	3	2	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	2	0	0
L·1	1	1	2	3			2	2	1	1	1	1	3	1	0	0	0	0	0	0	1	0	0	3	1	2	1	2	1	1	1	1	1	2	2	2	2	2	2	3	2	2	2	0	0	1	2	3	0	3	3	3	3	2	2	2	0	2	0	0	0	1	0	0	0	0	0	0	0	1	1	1	2	0	0
L·2	2	2	1	2			2	1	2	1	1	1	3	1	0	0	0	0	0	0	1	0	0	3	2	2	2	2	1	1	1	1	2	2	2	2	2	2	2	3	2	2	2	0	0	2	2	3	0	3	3	3	3	2	2	2	0	2	0	2	0	2	0	2	0	0	0	0	0	1	1	1	2	0	0
M·1	2	2	2	1			2	0	2	2	1	2	2	2	2	1	1	1	0	0	1	0	0	3	3	3	2	2	1	1	1	3	2	2	2	2	2	2	2	3	2	3	1	0	0	0	1	1	2	2	2	3	2	2	2	2	0	0	0	0	0	2	0	0	0	3	0	0	0	1	1	1	2	0	0
M·2	2	2	2	1			2	0	1	1	1	2	1	2	0	1	1	1	0	0	1	0	0	3	3	2	3	3	1	1	1	1	2	2	2	2	2	2	2	3	2	3	2	0	0	2	2	2	1	1	2	3	2	2	2	2	0	2	0	0	1	1	0	2	0	1	2	1		1	1	1	1	0	1
N·1	2	2	1	1			1	0	1	1	1	2	2	1	0	0	0	0	0	0	1	0	0	2	3	3	2	3	1	1	2	2	2	2	3	2	2	2	2	2	2	2	1	0	1	1	1	1	2	1	2	3	2	2	3	2	0	0	0	0	0	1	0	0	0	3	0	0	0	1	0	0	0	1	2
N·2	2	2	2	1			1	0	1	1	0	2	1	1	1	0	0	0	0	0	1	0	0	2	3	3	3	3	1	1	2	3	2	2	3	2	2	1	2	3	1	2	2	0	0	1	1	1	0	2	1	1	0	0	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	2
O·1	3	2	2	2			1	1	2	2	1	3	0	2	1	0	0	0	0	0	1	0	0	3	3	3	3	3	1	3	3	3	3	3	3	2	2	2	2	2	1	3	2	0	0	1	1	0	1	0	1	0	0	0	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	2	0	1	0	2
P·1	3	2	2	1			1	0	3	1	0	3	0	3	0	0	0	0	0	0	0	0	0	3	3	3	2	3	1	1	2	3	1	3	3	3	2	1	2	2	1	2	2	0	0	0	1	1	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	2	0	0	0	3
Q·1	2	2	2	1			1	1	2	2	0	3	0	2	0	0	0	0	0	0	0	0	0	3	3	2	3	3	1	3	3	3	3	3	3	2	2	2	2	2	1	2	2	0	0	0	1	0	0	0	1	1	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	2	0	1	0	2
Q·2	1	1	1	2			1	0	2	2	1	2	2	2	1	0	0	0	0	0	1	0	0	3	3	2	3	3	1	3	3	2	2	2	2	2	2	2	2	2	1	2	2	0	0	0	2	3	0	2	2	3	1	0	2	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	2	0	1	0	2
R·1	2	2	2	2			1	1	1	2	1	3	0	2	0	0	0	0	0	0	0	0	0	3	3	2	3	3	1	1	2	2	2	2	2	2	2	3	2	3	1	2	2	0	0	0	1	0	0	0	1	0	0	0	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	2	2	0	0	2
R·2	2	2	2	1			1	0	2	2	0	3	0	2	1	0	0	0	0	0	0	0	0	2	3	3	2	3	1	1	2	2	2	3	3	2	2	3	2	3	1	3	3	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	2	2	0	0	2
S·1	3	2	3	3			1	0	2	1	0	3	0	2	1	0	0	0	0	0	0	0	0	3	3	3	3	3	1	1	3	3	3	3	3	2	2	2	2	3	1	2	2	0	0	1	1	0	0	0	1	0	0	0	2	1	1	0	0	0	0	1	0	0	0	0	0	0	0	2	2	2	0	0	2

Figure 8c

MAGNITUDE TOTALS

Form of Expression For River Characteristics / Riverscape Units	Figure 9a Form of Expression Totals (valley/upland)												Figure 9b Categories Of Experience Totals																	
													Preservation U+F−Ed			Passive Recreation U+D+So+Sc+Sn−Ed			Active Recreation U+D+Sn+Sc+F+A+Dv			Agriculture C−U−F			Ext. Econ. Activity Rc+A−F−U			Int Site Development Dv+A−F−U		
	Uniqueness (U)	Diversity (D)	Fragility (F)	Seclusion (Sc)	Sensuality (Sn)	Seasonality (So)	Paddlebility (P)	Cultivability (C)	Resource Capability (Rc)	Site Developability (Dv)	Existing Development (Ed)	Accessibility (A)	Valley	Upland	Unit	Valley	Upland	Unit	Valley	Upland	Unit	Valley	Upland	Unit	Valley	Upland	Unit	Valley	Upland	Unit
A·1	50/16	63/15	22/7	20/2	4/2	17/4	15/0	5/15	7/10	7/14	14/21	9	155	102	257	238	114	352	221	138	368	36	92	128	38	87	134	38	91	138
A·2	58/14	65/14	21/7	24/0	9/2	10/4	12/0	10/15	7/10	13/15	18/21	7	161	100	261	248	113	361	248	138	393	31	94	125	28	89	124	32	94	133
B·1	58/14	63/14	25/7	21/0	9/2	12/4	10/0	8/17	5/10	11/13	16/28	9	170	93	263	243	106	349	226	136	362	22	96	118	19	89	117	25	92	126
B·2	43/14	59/14	18/7	15/0	7/2	12/4	10/0	16/18	6/10	13/13	16/28	8	145	93	238	220	106	326	219	136	363	55	96	151	45	85	138	96	52	151
B·3	36/15	53/17	16/10	13/-1	6/1	12/5	11/0	15/13	6/9	10/10	16/21	9	136	104	240	204	116	320	220	132	343	26	81	107	54	84	147	58	85	152
C·1	30/7	39/9	25/8	10/0	1/1	9/2	13/0	8/14	4/3	11/13	15/19	7	140	96	236	174	100	274	166	122	295	53	99	152	49	88	144	56	98	161
C·2	53/23	68/21	28/8	20/4	2/-1	11/6	15/0	3/3	10/11	0/8	15/13	4	166	118	284	239	140	379	215	147	366	22	72	94	29	80	113	19	77	100
C·3	54/13	73/16	31/7	22/-1	-1/0	10/5	11/0	12/14	8/9	9/11	20/23	6	165	97	262	238	110	348	226	132	364	27	94	121	23	89	118	24	91	121
C·4	55/19	73/19	18/10	9/-3	-1/-1	12/6	16/0	9/10	7/5	11/16	16/26	13	157	103	260	232	114	346	229	140	382	36	81	117	34	76	123	38	87	138
D·1	53/17	68/8	25/10	16/-5	-1/-7	9/5	12/0	8/12	10/8	9/14	17/29	7	161	98	259	228	99	327	220	127	354	30	85	115	32	81	120	31	87	125
E·1	38/13	45/14	22/5	6/0	-8/-8	11/4	13/0	14/15	6/9	18/13	25/32	10	135	86	221	167	91	258	177	127	314	54	95	149	46	91	147	58	95	163
E·2	33/13	39/14	20/7	8/3	-5/-1	10/4	10/0	17/15	7/7	23/12	23/24	3	130	96	226	162	109	271	178	134	315	64	95	159	54	87	144	70	92	165
E·3	40/14	46/13	20/9	14/2	3/-2	9/4	11/0	6/10	10/6	5/10	15/24	6	145	99	244	197	107	304	188	128	322	50	83	133	50	83	139	45	87	138
E·4	30/13	46/13	38/9	9/0	-21/-1	9/3	10/0	6/11	11/7	12/10	31/23	10	137	99	236	142	105	247	138	126	274	38	89	127	43	85	138	44	88	142
F·1	41/18	56/16	26/7	14/3	-1/-5	9/5	10/0	12/15	11/9	15/9	23/25	3	144	100	244	196	112	308	199	144	346	45	90	135	44	84	131	48	84	135
F·2	41/16	59/14	22/7	10/0	3/0	10/4	10/0	12/14	10/7	16/13	23/30	3	140	93	233	200	104	304	207	136	346	49	91	140	47	84	134	53	90	146
G·1	36/10	47/8	30/7	11/-1	-9/2	8/2	11/0	3/14	9/6	16/12	23/25	5	143	92	235	160	96	256	171	124	300	37	97	134	43	89	137	50	95	150
G·2	42/13	52/13	31/7	22/-3	6/0	9/3	10/0	11/11	5/6	13/11	17/24	10	156	96	252	214	102	316	208	140	358	38	91	129	32	86	128	40	91	141
H·1	54/14	70/16	24/6	22/-2	5/2	12/3	12/0	6/11	6/15	11/13	21/28	9	157	92	249	242	125	367	238	137	384	28	91	119	28	95	132	33	93	135
H·2	57/23	69/20	25/9	20/1	1/-1	12/3	14/0	7/13	7/18	11/13	18/35	12	164	97	261	241	111	352	233	147	392	25	81	106	25	86	123	29	81	122
H·3	28/14	42/14	26/7	8/-2	-12/-3	8/4	11/0	13/12	6/13	24/19	29/36	9	125	85	210	145	91	236	146	129	284	59	91	150	52	82	143	70	98	177
I·1	48/13	64/13	24/6	11/-3	-5/-7	12/3	10/0	9/13	7/14	17/19	23/32	14	149	87	236	207	87	294	211	129	354	37	94	131	35	95	144	45	100	159
I·2	21/16	27/13	27/6	1/-2	-1/-3	8/4	12/0	11/14	3/16	6/16	21/32	11	127	90	217	135	96	231	127	134	272	63	92	155	66	84	161	58	94	163
I·3	21/16	28/13	27/6	1/-2	0/-1	8/4	12/0	11/14	3/17	6/16	21/32	11	126	90	217	137	98	235	129	136	276	63	92	155	55	95	161	58	94	163
I·4	38/16	49/13	31/6	5/-2	-18/-4	9/4	11/0	13/15	10/15	11/19	33/40	11	136	82	218	150	87	237	154	136	301	44	93	137	41	93	145	42	97	150
J·1	42/18	59/16	29/7	5/4	-29/-11	10/5	11/0	13/14	13/15	22/20	45/40	10	126	85	211	142	92	234	170	140	320	42	89	131	42	90	142	51	95	156
K·1	51/15	81/14	28/10	14/0	0/-1	13/3	12/0	7/12	9/14	8/18	23/39	7	156	86	242	236	92	328	226	136	369	28	87	115	30	89	126	29	93	129
K·2	30/14	40/13	19/6	8/-2	-7/0	11/3	10/0	14/14	5/10	18/13	22/29	9	127	91	218	159	96	255	170	132	311	65	94	159	56	90	155	69	93	171
K·3	55/16	60/15	25/7	16/-3	1/-7	11/3	11/0	5/11	9/14	8/12	13/34	7	137	89	226	230	90	320	215	126	348	25	88	113	29	91	127	28	89	124
K·4	40/13	50/16	26/12	8/0	11/-2	10/3	11/0	5/7	7/11	3/9	16/26	6	150	99	249	203	104	307	186	124	316	39	82	121	41	86	133	37	84	127
K·5	49/15	56/15	21/11	15/-3	-4/2	11/4	12/0	6/8	9/11	10/6	19/27	9	151	99	250	205	106	311	202	124	335	36	82	118	39	85	133	40	80	129
L·1	43/15	54/17	27/10	10/1	5/3	9/3	11/0	5/10	6/8	7/8	14/25	5	156	100	256	207	114	321	192	132	329	35	85	120	36	83	124	37	83	125
L·2	54/18	74/19	25/8	18/-1	4/1	11/4	11/0	13/10	8/9	20/13	33/30	9	146	96	242	228	111	339	245	142	396	34	84	118	29	83	121	41	87	137
M·1	46/22	60/22	27/9	15/5	9/-4	9/6	11/0	4/7	9/11	0/9	11/22	2	162	109	271	228	129	357	203	145	350	31	76	107	36	80	118	27	78	107
M·2	55/20	72/19	25/8	22/2	-3/-2	11/5	12/0	9/5	12/12	11/14	29/32	12	151	96	247	228	112	340	232	145	389	29	77	106	32	84	128	31	86	129
N·1	49/19	57/19	24/8	17/4	13/-2	8/5	10/0	11/5	10/13	6/8	23/27	7	150	100	250	221	118	339	218	140	365	38	78	116	37	86	130	33	81	121
N·2	44/22	58/20	28/9	16/3	9/2	9/7	8/0	9/-1	10/12	20/0	19/11	9	153	120	273	217	143	360	219	138	366	37	68	105	38	81	128	48	69	126
O·1	54/27	60/26	28/9	14/2	9/4	5/7	6/0	1/-5	11/15	2/-4	12/8	7	170	128	298	230	158	388	211	146	364	19	59	78	29	79	115	20	60	87
P·1	53/25	60/21	26/10	25/7	6/6	5/6	6/0	-3/-7	9/14	-7/-5	5/5	4	174	130	204	244	160	304	227	163	394	18	58	76	30	79	113	14	60	78
Q·1	59/26	58/24	30/10	20/5	13/6	5/7	6/0	1/-4	9/13	1/-5	11/5	5	178	131	209	244	163	407	221	146	372	12	60	72	20	77	102	12	59	76
Q·2	43/22	45/21	28/7	7/1	4/3	5/5	4/0	4/1	8/13	10/3	22/14	11	149	115	264	182	138	320	181	143	335	33	72	105	37	84	132	39	74	124
R·1	43/23	37/21	27/10	7/5	8/4	6/6	4/0	3/0	7/15	1/-1	12/5	6	158	118	276	189	144	333	169	144	319	33	67	100	37	82	125	31	66	103
R·2	59/23	51/20	25/11	18/4	4/3	6/5	5/0	2/-5	9/14	2/-5	7/3	7	177	131	308	231	152	383	209	134	350	18	61	79	25	80	112	18	61	86
S·1	55/30	53/23	23/9	16/4	8/8	6/7	6/0	2/-2	9/17	0/-3	14/7	11	164	132	296	224	165	389	209	153	373	24	59	83	31	78	120	22	58	91

Figure 9

Questionnaire

As a means of informing residents along the river that the study had been initiated a preliminary information package was sent out to everyone living within one mile of the streamway. Included with this package there was a questionnaire to be completed and returned to the Red Deer Regional Planning Commission. Ninety-nine replies were received. No statistical evaluation or summary of these was attempted because the questions did not lend themselves to that type of analysis. The concerns and recommendations presented were carefully considered.

Newsletters

While the study was underway two newsletters were prepared and mailed out to all residents who had received the information and questionnaire package. These newsletters were intended to accomplish several things. First of all, they discussed some of the issues being dealt with in the study, secondly, they kept the public informed of the progress of the study; thirdly they initiated thinking concerning the interrelationships of all segments of the river and the residents along it; and fourthly they encouraged public response and involvement.

Public Meetings

Arrangements were made with the community associations located along the study corridor for meetings to be called where the issues, implications, intentions, scope and limitations of the study could be presented by the Commission staff. An equally important function of these meetings was to provide the interested residents a face to face opportunity to question the planners and express their concerns and recommendations. Meetings were sponsored by four different community associations. Thereafter, two of these communities struck a small working group to meet with the planning research officer and subsequently prepare a list of specific recommendations.

Three other meetings were held. Staff from the Olds College and the Department of Agriculture met to discuss the role of agriculture along the river, the Red Deer River Naturalists invited the Planning Commission to give a presentation concerning the Little Red Deer River, and students at the Lindsay Thurber Comprehensive High School requested two meetings following which a term field research project was focused on the Little Red.

Following the publication of the planning report wherein several management alternatives are offered, additional meetings will be arranged. At those meetings there will be opportunities for feedback from all sectors of the public. From this feedback revisions to the initial proposals can be made and an appropriate management alternative designed.

SELECT CATEGORIES OF EXPERIENCE

Preservation

To fill this category it is necessary to discover and document those areas of the Little Red Deer River which exhibit the highest magnitude of unique and fragile characteristics and the extent that these have been intruded upon by existing development. That is, the objective is to locate those units which are likely to be distinctive, to possess a state of rarity, scarcity, vulnerability, richness and variation of condition, isolated and unabused by man, units which display maximum river and riverscape integrity.

The suitability of each unit for preservation is determined by reviewing the Form of Expression matrix (Figure 9a). To locate potential preservation areas, those characteristics which are unique and fragile are extracted and their magnitudes are totalled. (Comparable totals can be generated for each component or combination of components of the units. That is a total for the streamway and valley may be derived separately from the river upland).

Once this total has been derived, the degree of encroachment by existing development must then be subtracted to provide the final preservation total. When these totals have been calculated for all units their relative value for preservation can be shown in tabular or graphic form. A tabular display of the Evaluation Totals is presented on Figure 9b, and a graphic illustration of the Preservation totals is given on Figure 11a.[14] This provides a convenient basis for comparisons between the alternatives. Also the graph presents values for the streamway and valley, the upland beyond the valley-side break, and for the valley, and upland combined. This separation permits a free comparison of the highly variable valley separately from the largely consistent upland.

Use of the preserved natural resource in its unaltered state can be as subtle and intangible as the knowledge that the resource exists, or as concrete as actually experiencing the resource physically or visually. The essential equipment for this type of an experience comes in two forms: the mind or consciousness, and the body or presence of the individual focused on or brought to a designated location.

Actual use of preservation resources must be considered a privilege requiring a high degree of knowledge and discretion. Human activity in these areas needs to be regulated so that the essential state of health of the unit is retained. Disruption of the natural ecosystems and encroachment of critically important portions of land is to be guarded against, and proper buffering from surrounding activity (particularly upstream) is essential. Thus, as a category "preservation" is meant to retain an area in its natural state while at the same time offering sanctuary for wildlife and allowing observation of ecological processes. In short, this category is intended to be a place where the citizen may find that which still contains and embodies the best the Little Red Deer River has to offer: benchmarks of the river's integrity.

Passive Recreation

Passive recreation embodies the use of natural resources at a very low intensity and therefore tends to cause very little impact on those resources. The prime reason for restricting an area to passive recreation is actually to preserve unique and fragile features while making possible some amount of human presence. The major distinction between preservation and passive recreation management areas is that preservation areas need not necessarily have features that attract recreation, but they are otherwise unique or fragile, whereas passive recreation areas have esthetic appeal but cannot tolerate heavy use.

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[14] Figure 11 shows each unit value as a percentage of the average (mean) value rather than as magnitude scores. Percent of mean calculations are discussed in the next section.

Passive recreation categorizes those recreational activities of relatively low environmental impact which, due to their non-intensive or dispersed nature, disrupt the natural system only minimally. It usually requires simple, light-weight or portable equipment, such as a fishing rod, tents, stove, canoe or raft and accessory equipment related to, but not essential for an activity. Examples of passive recreation activities that may be undertaken relative to the river are:

swimming
wading
fishing
rafting
canoeing and kayaking
aquatic study
picnicking
hiking
nature study
hunting
cross-country skiing
snow shoeing
cycling
viewing

Passive recreation site suitability relies on unique characteristics that have not been altered by present development. The site should also possess considerable diversity, which suggests a capacity to provide esthetic attraction to people. This esthetic attraction is also enhanced by environmental factors that are accentuated by seasonality or that generate sensory satisfaction.

To locate areas suitable for passive recreation, and to identify the relative suitability of all areas for passive recreation the following steps are followed. From the matrix showing Form of Expression Totals we extract the magnitude values for those characteristics which demonstrate uniqueness and diversity plus those showing seasonality, seclusion and sensuality. By summing these five within a unit we generate a numerical total for passive recreation.

The degree to which the passive recreation character of a unit has been encroached on by existing development is then subtracted from that total to yield a net total for passive recreation. Carrying out this calculation for each unit and displaying the result in tabular and graphic form permits a quick comparison of all units along the Little Red Deer River as to their relative attributes for passive recreation. Due to the large discrepancy in land use practices between river valley areas and river uplands it is useful to carry out the calculations for these two segments of each unit independently. The Passive Recreation graph is on Figure 11b.

Active Recreation

Active recreation sites relate to natural resources which are more highly resilient and dynamically capable of intensive use in short cycles. To be suitable for active recreation an area must be able to sustain periods of relatively high environmental impact due to the intensive, or concentrated nature of many of the activities pursued.

The objective for active recreation site selection and for rating sites as to their suitability for recreation is to locate those characteristics which are most likely to possess a state of complexity and richness, are quite accessible, have low fragility levels (great ability to withstand use and recover from heavy use effects); in short,have high riverscape integrity, offering a variety of conditions which are not in precarious balance, conveniently located and highly accessible.

In locating suitable sites for active recreation the goal is to offer the highest level of experience to the user. So, as before, a search is made for areas along the Little Red Deer River which exhibit a high magnitude of unique characteristics, and again high levels of diversity, both of which provide esthetic/sensory appeal. However, site developability, accessibility, low fragility and a reasonable amount of separation from conflicting landscape uses or developments are especially required.

A quantitative total for Active Recreation is generated by summing all unique, diverse, sensual and seclusion values recorded on the Form of Expression Totals matrix. Fragility values are then subtracted causing the recreation potential to decline. Further to this, an expression of the ease of accessibility to the unit, the developability of the site, and the proximity of developed facilities for potentially conflicting non-recreational uses[15] is extracted from the matrix. The first two are added and the third is subtracted from the previous sum since they function as positive and negative modifiers respectively. The resultant total is the net total for Active Recreation (See Figures 9b and 11c).

Active recreation categorizes those recreational activities of relatively high environmental impact which, due to their concentrated and intensive nature and/or frequency, would be potentially disruptive of fragile, natural systems and which, therefore require sensitive site placement, design and maintenance or management. Active recreation usually suggests either a reliance on major equipment or implies concentration of users in a limited area participating in almost any recreation activity. Examples of activities included are grouped below:

boating
swimming
water skiing
rafting
tubing

drive-in camping
hike-in camping
boat-in camping
group camping
institutional camping
accomodation lodging
cottaging
snowmobiling

Examples of facilities for active recreation are:

basic or serviced campgrounds,
institutional camps
commercial recreation lodges
golf courses
boat docks
private seasonal-use cottages

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[15] This value was deleted from the calculation at this stage since it was considered more appropriate to weight the effects of adjacent uses according to size, distance and resident opinion.

Agriculture

Sites which provide favourable conditions for agricultural are characteristically based on productive or fertile soils and subdued, cultivable topography (assuming a favourable climate is present). To be suitable for agricultural practices an area must also be able to sustain the impacts of repeated cultivation and harvesting or else the continuous grazing and trampling of livestock without experiencing accelerated erosion or other unfavourable environmental change. Further to these attributes, agricultural lands are largely cleared or are naturally free of trees, and lack swamp or bog conditions. Where these conditions persist the area is nearly always suitable for farming and its associated structures and activities. Along river shorelands the most sensitive concern related to agriculture is the possibility of livestock and other agricultural wastes, including silt and chemicals entering the watercourse. Where these events occur they are interpreted as missfits.

In determining the agricultural value of each unit along the Little Red Deer riverscape the intent is to recognize the existing state of agricultural practices in this area, but also to present an equitable case for the suitability of certain units to be managed for continued agricultural purposes and to determine both the appropriate proximity of these activities to the river and their dependency on the river resources.

As before, a search is made of the matrix showimg Form of Expression Totals to extract the values for all expressions of cultivability. Also affecting the suitability of areas for agriculture are expressions of uniqueness and fragility. Both are considered as negative modifiers and are therefore subtracted from the previous total to generate an adjusted total for agriculture. These totals may then be compared to identify the relative suitability of units along the Little Red Deer River for agriculture. There may be a major contrast between the agricultural potential in the valley compared to the valley upland in the same river unit. This will be the case particularly where sharp valley breaks occur and where valley enclosure is sharply expressed. For this reason, these two components of the unit are totalled separately. Where the valley component shows a very unfavourable agricultural suitability while the upland is quite favourable the data may be reviewed to determine the particular decision that should be reached. Also, there may be certain mitigating factors in a unit which make agriculture appropriate in spite of negative factors documented in the inventory. These must be assessed when final assignments are made (See Figure 9b and Figure 11d).

In a systematic process of resource evaluation agriculture poses some difficult problems. First of all agriculture is not all summed up in the practice of cultivation and crop production. Its various elements are actually quite contrasting in form, resource dependency and impacts. For example, there is livestock grazing as practiced on extensive private or public grazing range, there is forage production on intensively nurtured hayfields where cultivation is infrequent and equipment is relatively small, there is also the feedlot situation where a substantial grain and forage production base exists but where a development site is intensively designed and used for finishing livestock in close confinement and generally in large quantities. The traditional mixed farm will practice all of these to some degree and intensity.

In the present study however, the analysis is oriented toward evaluating suitability for agriculture by dealing mainly with characteristics which permit mechanized farm equipment to operate and those which point to a probable capacity of the unit to produce agricultural products. Where these characteristics are expressed certain intensification may be possible and in some instances already exist, but the specific suitability of the units for these operátions is quite site-specific and pertains mainly to esthetic and environmental concerns. These are discussed separately later in this report.

Extensive Economic Activity:

The term, extensive economic activity, is used to describe those uses including oil and gas exploration and recovery, timber harvesting, and extensive livestock grazing. In many instances these uses are pursued together with localized more intensive use, while elsewhere any of these extensive uses may be an exclusive though remote use. In either event, these activities may amount to major economic pursuits where conditions are facourable for them.

From the Form of Expression matrix the values are extracted for Resource Capability. This total reflects the inherent natural resource quality for the unit without regard for any constraints on these extensive use activities. An adjustment has to be made to this total therefore to include the positive modifier-accessibility. Accessibility to a site increases its utility over comparable or even higher quality sites that cannot be reached. Certain negative modifiers also must be considered. These are fragility and uniqueness. Totals for those characteristics expressing these qualities must be subtracted from the previous total. This implies that sensitive areas and irreplaceable scarce features are less suitable for exploitation than are resistant, commonplace features. Following these calculations the resulting value is an adjusted total for extensive economic activity. Relative values for units along the Little Red Deer River are displayed in graphic form for ease of comparison on Figure 14. (Also see Figure 11e.

It should be noted here that, where the two sides of the valley are different a separate inventory and analysis should be carried out for each side. This is consistent with lake shoreland planning where each unit faces onto the lake. In river shoreland planning the differences from side to side may not be as great as are the linkages between the two. That is, the two sides and the valley bottom tend to constitute a complete unit. However, where this is not the case, it is confusing to merge them in the inventory stage because any future review of the data loses the distinctions and erroneous allocations may occur. Because the Little Red Deer River Study is a pilot study, intended to test procedures and conserve time this was not done. As a result some adjustments are made in allocating uses and those are based on personal familiarity with the area rather than on application of the tabular data.

Intensive Site Development

Intensive site development is a general term that includes major site developments along the lines of gas processing plants, gravel pits, coal mines, pulp mills, industrial, commercial, and retail facilities, grouped residential developments, and integrated recreation complexes. Each of these forms of development is based on its own locational requirements. These may be substantially different so that they can appear to share nothing in common. They do, however, have a common dependency on a physical site which is accessible and capable of intensive use without unacceptable impacts on the site or adjacent area. The appropriateness or suitability of any of the intensive developments being located in proximity to this or any river will partially be a policy issue.

A search is made of the matrix again, this time to extract magnitude values for all expressions of site developability. Since accessibility is required, those characteristics which express some degree of accessibility are added on to the total. Thereafter, fragility and uniqueness values are subtracted because they reflect sensitivity or qualities of invaluable character. The net unit value for intensive site development is generated from these calculations. (Figures 9b and 11f).

Where new intensive developments are likely to occur detailed site studies are required and so this evaluation is not suggested as a definitive indication of favourable areas for development. However, where the development is a recreation orientated facility for any of the uses listed under the previously discussed Active Recreation section, then those units having a high total for both active recreation and for site development would have the most pronounced suitability, exceeding high totals for either of these considered separately. However, where any intensive development is in close proximity to another use with which it conflicts an adjustment must be made in the suitability score.

Summary

A summary of the previously discussed procedure is presented on the figure below. This procedure is used to determine the magnitude of characteristics demonstrated in each unit for each category of experience. The values derived from this procedure are shown on the Categories of Experience matrix which is Figure 9b. From the totals presented it is obvious which units provide the higher suitabilities for each form of activity.

Once each unit's potential has been evaluated in this way, it is necessary to determine which type of use the unit may best fill. To do this, the overall scores derived from the above evaluation is not sufficient.

Per Cent of Mean Comparisons

The values for different categories of experience in a unit are not directly comparable as is shown in Figure 9b. The magnitude values can only be compared within each category. To facilitate comparisons between different categories of experience all values are translated into 'percentage of the mean' scores. To accomplish this translation, all scores shown on Figure 9b are averaged within each category. Thereafter, each score is converted to a value which is some percentage of that average score. Some are above average while others are below the average. But since all scores relate to a common base (the average or mean) score, and a common base is determined for each category of experience, we can compare these individual percentages between units and between categories.[17] Again, the technique used for displaying these values is a matrix (See Figure 10).

A review of the Per cent of Mean Matrix reveals that one of the six use categories scores more highly than other uses for each unit. A simple tabulation of these high mean scores gives us a first overall impression of 'best use' for each unit. Except for any errors entering the evaluation during the inventory process, or oversights in compiling the totals, these high mean scores are a preliminary indication of priorities in allocating land use. In allocating areas for functions, however,

Form of Expression Categories of Experience	Uniqueness	Diversity	Fragility	Seclusion	Seasonality	Sensuality	Paddleability[16]	Cultivability	Resource Capability	Site Developability	Existing Development	Accessibility	Proximity to Conflict
Preservation	+		+								-		
Passive Recreation	+	+		+	+	+					-		
Active Recreation	+	+	-	+		+				+		+	-
Agriculture	-		-					+					
Intensive Site Development	-		-							+		+	-
Extensive Economic Activity	-		-						+			+	

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16. Paddleability is considered separately and was discussed previously.
17. Figure 11 displays the "percent of mean" scores for each Category of Experience rather than "magnitude" scores.

	PERCENT OF MEAN																	
	Preservation Total see Fig. 11a			Passive Recreation Total see Fig. 11b			Active Recreation Total see Fig. 11c			Agriculture Total see Fig. 11d			Ext. Econ. Activity Total see Fig. 11e			Int. Site Development Total see Fig. 11f		
	Valley	Upland	Unit	Valley	Upland	Unit	Valley	Upland	Unit	Valley	Upland	Unit	Valley	Upland	Unit	Valley	Upland	Unit
A·1	104	101	109	117	101	114	111	102	104	92	110	97	106	102	98	95	107	96
A·2	100	99	106	133	100	123	125	102	112	79	112	99	78	104	89	80	111	100
B·1	114	92	109	120	94	109	114	101	105	56	114	97	53	104	85	62	108	95
B·2	97	92	84	108	94	98	110	101	101	141	114	130	125	100	109	130	108	108
B·3	89	103	98	118	103	103	102	98	100	67	96	88	150	99	111	145	100	114
C·1	93	95	96	86	88	88	83	90	86	136	118	125	133	103	109	138	104	121
C·2	111	117	116	118	124	91	108	109	107	56	86	77	81	94	86	48	91	75
C·3	110	96	107	117	97	112	114	98	106	69	112	101	64	105	89	58	107	91
C·4	105	102	106	114	101	111	115	104	112	92	96	96	95	89	93	95	102	104
D·1	108	97	106	112	88	105	111	94	104	77	101	94	89	95	91	78	102	94
E·1	91	85	90	82	81	83	89	94	92	138	113	122	125	107	111	145	112	123
E·2	87	95	92	80	96	84	89	99	92	164	113	139	150	114	109	172	108	124
E·3	99	98	102	97	95	97	94	95	94	128	100	109	139	98	105	112	102	104
E·4	96	98	96	69	93	79	69	93	80	110	106	104	119	100	105	110	104	107
F·1	97	99	102	97	99	99	100	107	101	113	107	111	122	99	99	120	99	105
F·2	94	92	95	99	91	97	104	101	101	126	108	115	131	99	102	132	106	110
G·1	96	91	96	79	85	82	86	92	88	95	115	110	119	105	104	125	112	113
G·2	105	95	103	105	90	101	105	104	105	97	108	106	92	101	105	100	107	106
H·1	105	91	101	119	111	118	120	101	112	72	108	98	78	112	100	82	109	102
H·2	110	96	107	118	98	113	117	109	115	74	96	87	69	113	93	72	95	92
H·3	84	84	86	71	81	77	73	96	112	149	108	123	144	96	108	175	115	133
I·1	100	86	96	102	97	94	106	96	104	95	112	107	97	112	109	112	118	120
I·2	85	89	88	66	85	74	64	99	80	162	110	127	181	89	122	145	111	123
I·3	85	89	88	67	87	75	65	101	81	159	110	127	153	112	122	145	111	123
I·4	91	81	89	74	77	76	77	101	88	113	111	112	114	109	110	105	114	113
J·1	85	84	86	70	81	75	85	104	94	108	106	107	117	106	108	125	112	117
K·1	105	85	99	116	81	105	114	101	108	72	104	94	83	105	95	72	109	129
K·2	85	90	89	79	85	82	85	98	91	167	112	130	156	106	117	160	109	129
K·3	92	88	92	113	88	103	108	93	102	64	105	93	89	107	96	70	105	93
K·4	101	98	101	100	92	98	93	92	92	100	98	99	119	101	101	92	99	95
K·5	101	98	102	101	94	100	102	92	98	90	98	97	108	100	101	100	94	97
L·1	105	99	104	102	101	103	96	98	96	90	108	98	100	98	94	92	98	94
L·2	98	85	99	112	98	109	123	105	116	87	107	97	78	98	92	102	102	103
M·1	109	108	110	112	114	114	102	106	102	77	91	88	100	94	89	68	92	80
M·2	101	95	101	112	99	109	117	106	114	72	92	87	89	99	97	78	101	97
N·1	101	99	102	109	104	128	110	104	107	92	93	103	103	101	98	85	95	91
N·2	103	119	111	106	126	115	110	102	107	87	81	86	106	95	97	108	81	95
O·1	114	127	121	114	140	124	106	93	106	49	70	64	81	93	87	50	71	65
P·1	117	129	83	120	142	97	114	121	115	46	69	62	83	93	86	35	71	57
Q·1	119	130	85	120	144	134	111	108	109	31	71	59	56	91	83	30	69	57
Q·2	100	114	108	90	122	103	91	106	98	85	86	86	103	99	100	90	87	93
R·1	106	117	113	93	127	107	85	107	93	79	80	82	103	96	95	78	78	77
R·2	119	130	126	114	135	123	105	99	102	46	72	65	69	94	85	45	72	65
S·1	110	131	121	111	146	125	105	113	109	49	70	68	86	93	91	55	68	68

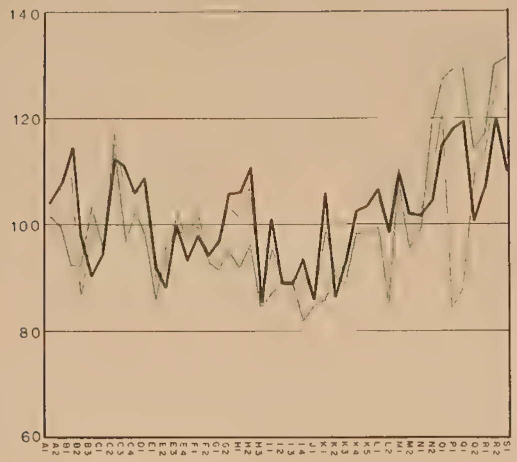
Figure 10

Figure 11

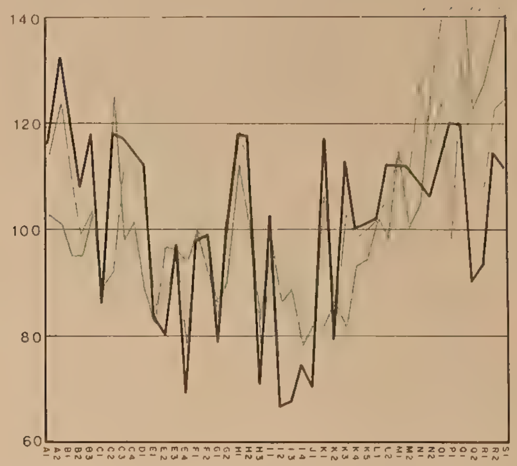
GENENERALIZED POTENTIAL FOR EACH UNIT

Expressed As Percent Of Mean

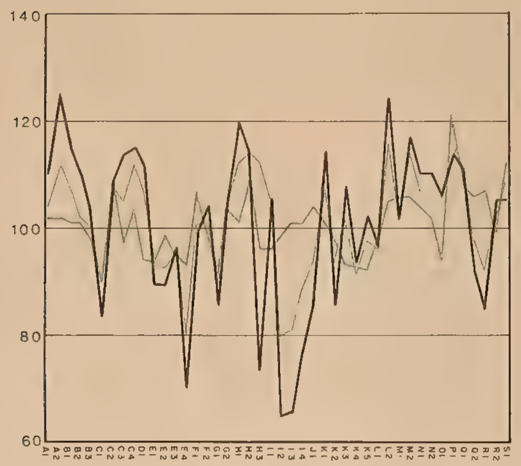
—— UPLAND —— UNIT —— VALLEY



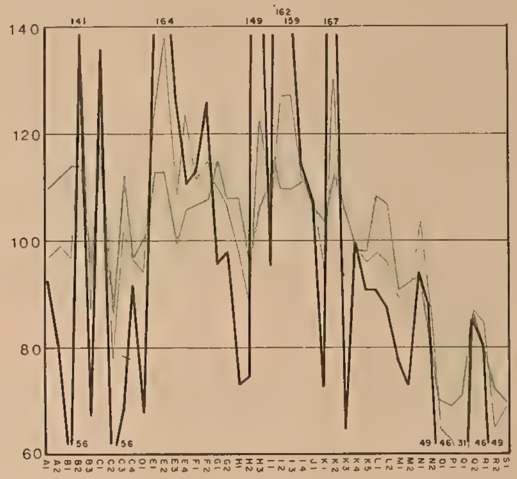
Preservation 11a



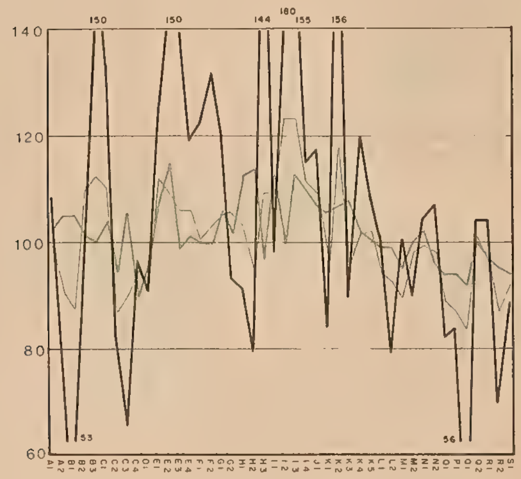
Passive Recreation 11b



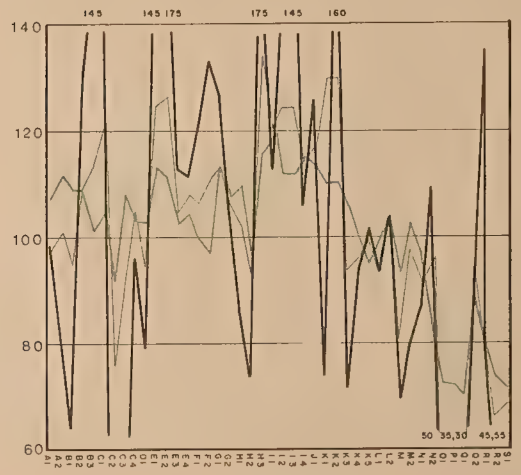
Active Recreation 11c



Agriculture 11d



Extensive Economic Activity 11e



Intensive Site Development 11f

it is necessary to introduce safeguards for features which are either unique or fragile. Therefore, environmental impacts are considered. Once this has been done, revised priorities can be worked out according to alternative preferences so as to more closely reflect the interests and conditions along the Little Red Deer Valley.

Preservation sites are identified by their susceptibility to disturbance, they represent the landscape in its most pristine form, and should be selected first, pre-empting other potential uses. Also, it must be remembered that, for recreation, river valleys provide landscape conditions which exceed the quality and appeal of non-valley and non-shoreland landscapes. They also offer natural amenities and forms of recreational activity which are not replicable beyond the valleys. Hence recreational opportunities in the valley should be selected prior to uses which may be supplied equally well beyond the valley itself.

Agriculture is a traditional enterprise along most of the Little Red Deer River. Most land under review in this Study is owned by agricultural operators. For them the river is fairly vital as an esthetic setting for residential locations and as a contributor to the natural resource base upon which the agricultural operation depends. So agriculture should be given high priority in site use designations. Having stated this, it is still recognized that stream banks and valley sides do not provide locations as favourable for cultivation as are available on the uplands. However, some terraces and broad floodplains are very productive when cleared and seeded to crops. It is not true though, that lands of similar productivity are non-replicable beyond the valley. It must also be recognized that some agricultural activities are major contributors to deleterious conditions developing in watercourses, and particularly so when those activities occur in close proximity to the banks of the stream. Considering both aspects of this two sided issue it seems inappropriate to give unquestioned preference to agriculture below the valley breaks.

More intensive activities, particularly those associated with developed facilities of an intensive nature have to receive low priority in a ranking based on stress to the environment. Industrial plants, cottage or county residence subdivisions, integrated recreation complexes and commercial establishments are considered here. Low priority for these does not mean they lack importance in the overall analysis, but they are designated for locations which have not been exempted by virtue or low ecological tolerance.

Applying these principles to the Percent of Mean scores produces a generalized indication of the highest potentials for use. This evaluation is based on a systematic analysis of the detailed ecological characteristics present in each unit. This generalized potential is shown on Map 15.

Elaboration of Site Characteristics

Having produced the Percent of Mean matrix and Map 15, there is an impression given that conditions throughout a unit are more or less homogeneous. In many respects they are, this is why the units were selected initially. However, the more thorough the understanding or documentation of information is, the less homogeneous the unit appears. The units were selected at the beginning of the Study when the information base was less complete, rather than at its completion, when a more thorough bank of information is available. For the sake of emphasis therefore, it is stated now that Map 15 is, at best a generalization of potential functions along the river. The units are easy to locate and relate to and are quite adequate for most management issues. Since there are some very distinctive site differences within particular units, it is desirable, if convenient, to display these differences. Fortunately, this does not require a great deal of new documentation, rather it entails an evaluation of already gathered data. As is evident from a study of Maps 9,10 and 11, there are major bio-physical differences along the river and these differences are not so much related to the units selected for this Study as they are to the changes from a channel situation to an upland situation. There are also strong differences evident from left bank to right bank within a unit and shifts of conditions over very short spaces along the length of the river, in part due only to the meandering configuration of the channel. As unimportant as these may initially appear, they are as capable of determining function as any characteristic would be if it extended the length of the unit. At this point in the analysis, it seemed appropriate to accentuate these site differences and to plot their potentials using the same categories of experience used on Map 15. Both Map 15 and the Percent of Mean matrix are used in this procedure, serving as controls, while Maps 9, 10 and 11 and detailed records from each stage of the data gathering and documentation where reviewed. The results are presented on Map 16, Highest Potential Categories of Experience.[18]

BENCHMARKS OF RIVER EXPERIENCE

The final component of the evaluation section of this study attempts to isolate specific sites which demonstrate exemplary qualities of the riverscape. These are called benchmarks of river experience (integrity). These benchmarks are short segments or specific sites where particular features of the river's character are clearly evident. They are located by an evaluation of the uniqueness column of the Form of Expression Totals matrix (Figure 9a).

Proceeding upstream from the mouth of the river eight benchmark areas were identified. Each scores highly on the uniqueness column. Detailed descriptions of each benchmark area are given later in this report under the title, Generalized Potential in Appendix A. But the main emphasis in each of these units is to recognize the dominant role of the river in each. Each unit has been singled out because of the high degree of integrity evident in the local scene.

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[18] Map 16 only displays the portion of the Study area that is located in the Red Deer Regional Planning Commission. The most detailed data were gathered for this part. It should also be mentioned here that Agriculture and Extensive Economic Activity are combined as "Agriculture" on Maps 15 & 16. This would not be true in the Green Area.

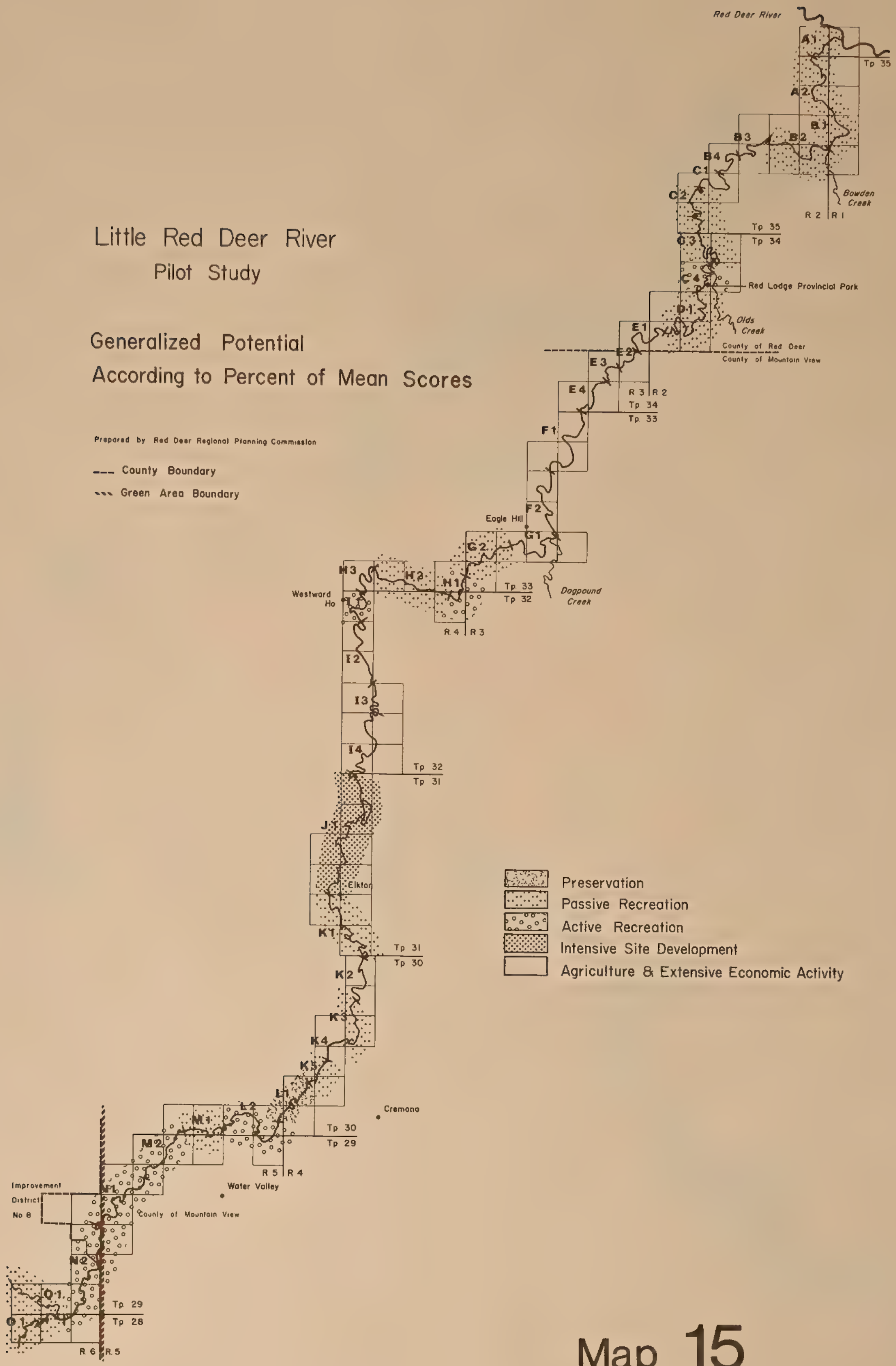
Little Red Deer River
Pilot Study

Generalized Potential According to Percent of Mean Scores

Prepared by Red Deer Regional Planning Commission

--- County Boundary

~~~ Green Area Boundary



- ▨ Preservation
- ▨ Passive Recreation
- ▨ Active Recreation
- ▨ Intensive Site Development
- ☐ Agriculture & Extensive Economic Activity

Map 15
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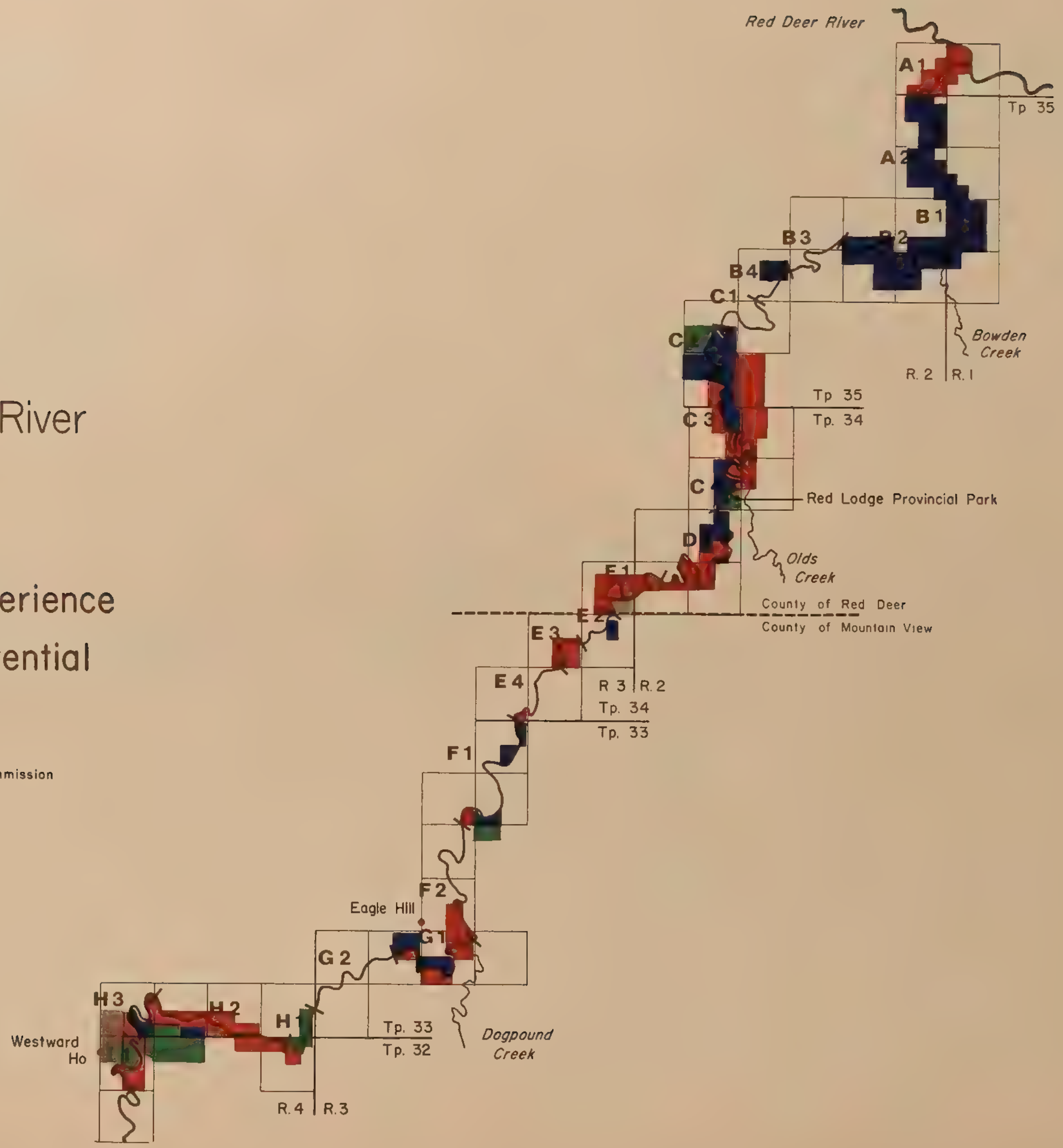
Little Red Deer River
Pilot Study

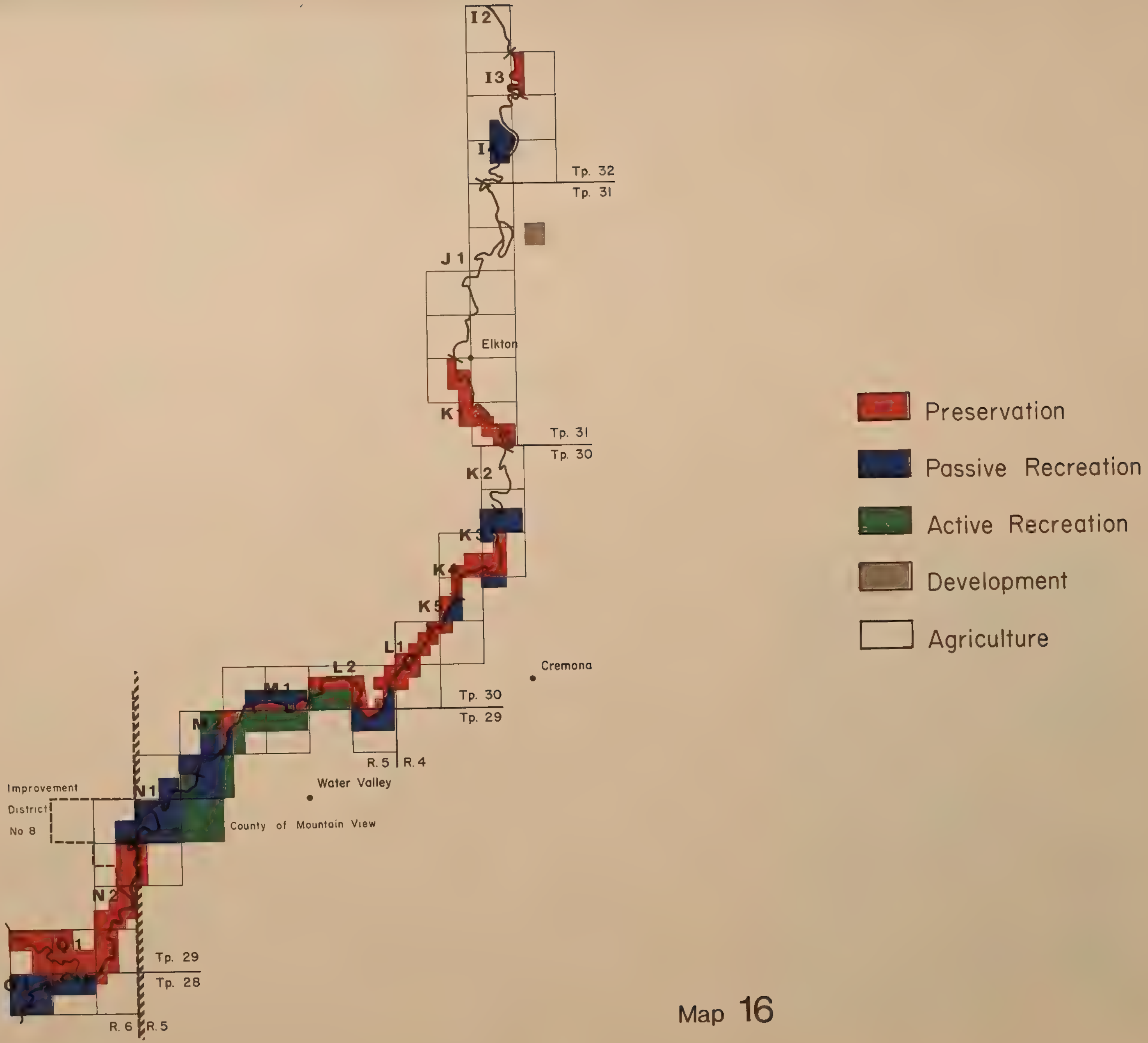
Categories of Experience
Highest Use Potential



Prepared by Red Deer Regional Planning Commission

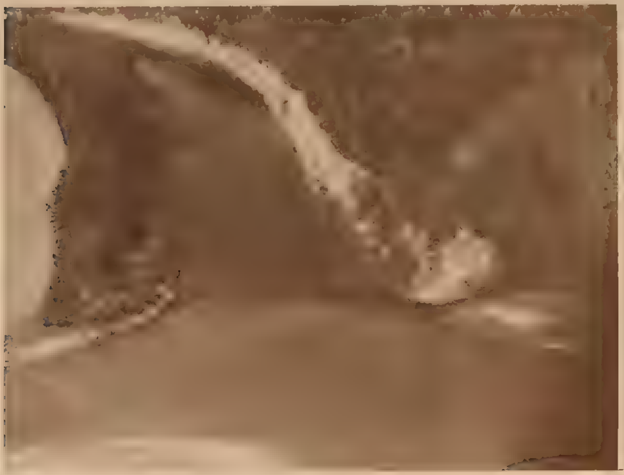
--- County Boundary

⸌⸌⸌ Green Area Boundary


I 2
I 3
I 4
Tp. 32
Tp. 31
J 1
Elkton
K 1
Tp. 31
Tp. 30
K 2
K 3
K 4
K 5
L 1
L 2
Cremona
Tp. 30
Tp. 29
M 1
M 2
R. 5
R. 4
Water Valley
Improvement
District
No 8
N 1
County of Mountain View
N 2
O 1
Tp. 29
Tp. 28
R. 6
R. 5
Preservation
Passive Recreation
Active Recreation
Development
Agriculture

Map 16

Man's encroachments are either minimal or have been very compatible with the site. Natural streamway and shoreland qualities continue to be dominant. In these locations there is a particularly strong incentive to orientate all future activities along courses which respect and focus on the streamside and valley characteristics uniquely offered by the site. The eight benchmark areas are A-Run, C-Run, D-Run, Unit H-2, Unit K-1, Unit L-2 , Unit M-2, and Unit Q-1.



The most obvious benchmark experience site is the confluence with the Red Deer River.

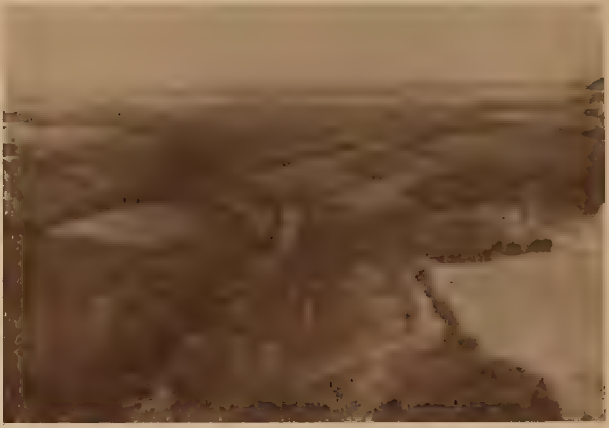
7 GUIDELINES AND STANDARDS

RECOMMENDED MANAGEMENT GUIDELINES - GENERAL

In the previous pages the approach was developed, this approach was applied to the Little Red Deer River Study area, the data were evaluated and preliminary selections of use were made. In the present chapter it is necessary to present in some detail, a philosophical framework for river management. This is done in the following pages by presenting detailed guidelines for river shorelands and standards of management for each of the major forms of use. The following guidelines apply along the entire length of the Little Red Deer River.

1. A clearly understood and defendable streamside preservation fringe should be identified and established so that the natural geo-hydraulic processes characteristic of the river may continue to function without undue risk or damage to shoreland facilities or users. This preservation fringe should be known as the Streamway Corridor and includes all wet and dry channels of the river plus the shorelands situated below the bank-full level (flood stage) and an additional 10 meter wide shoreland fringe. The prime function of this Streamway Corridor is to preserve the streamway and its immediate shoreland and to supply streamway resource based public use opportunities. Facility placement or development in this corridor needs to be tolerant to inundation by floodwaters without presenting impedence or any form of obstruction to flow in the floodway. Except for cross-valley linkages for linear structures such as roads and pipelines or for installations relating to water or river management the Streamway Corridor would not be available for developments and resource exploitation. The natural activity of the watercourse, including erosion, accretion, flooding and low flow are recognized as natural processes within the corridor and are generally considered positive components of the geo-hydraulic river system. Management may be brought to bear on this system where the natural functioning is considered wasteful or inappropriate. No adjustments to the natural processes acting here should be made simply from the standpoint of real estate sheltering.

2. Along a watercourse there is an extended band of stream influence where various stream related phenomena occur. The condition of this land and its management has a direct influence on the character and functioning of the watercourses, and the presence of the watercourse has a direct influence on the character and use of this land. This Streamway Influence Belt (S.I.B.) is defined to include the Streamway Corridor, the entire floodplain and a 100 meter wide shoreland-fringe. Where the floodplain lacks distinction, or where a distinct valley-top break-in-slope exists, the S.I.B. extends to 1 km beyond the nearest wet channel or 100 meters beyond the break-in-slope, which ever is relevant.



The Streamway Influence Belt is not a preservation or non-use area such as the Streamway Corridor but it is a pre-defined zone where special management controls and operational measures would be applied. The purpose of these controls and measures is to prevent developments of various types from proceeding in locations where those developments introduce undesirable influences on the natural geo-hydraulic functioning of the streamway or where the natural geo-hydraulic functioning of the streamway will introduce damage or risks to the developments. Certain developments are completely excluded from the Streamway Influence Belt (e.g. feedlots and their catch basins and municipal sewage lagoons), but in most instances approval or acceptance with restrictions is at the discretion of the responsible municipal council acting on its legislated authority and within the constraints of environmental or health legislation.

To guarantee the appropriate regulation of shoreland use throughout this belt, no change in land or water use would be permitted here except upon securing a permit from Council. Various uses, which currently exist in the area now called the Streamway Influence Belt are incompatible. Upon implementation of this plan, the Council may establish certain requirements for these sites and developments so that negative effects to both the streamway and the development may be minimized. Such uses or developments will be considered "nonconforming" so as to avoid regarding them as precedent for future development.

Within the Streamway Influence Belt landowners should be subject to regulations which reinforce the guidelines adopted in this plan and which recognize the existence of a public resource corridor, which is the river. These regulations are as follows:

a) Existing requirements of the Planning Act - Part 4, Division 1 and of the Subdivision and Transfer Regulation.

b) The use or operation of land or facilities situated in the Streamway Influence Belt must be such as not to cause any objectionable or dangerous condition which will interfere with the quality or quantity of water in the stream beyond those levels permitted through riparian rights legislation.

c) The use of lands in the Streamway Influence Belt must not cause excessive:
- fluctuations in flow either through clearing or landscaping,
- oil or sludge in the stream,
- chemical or biological effluent in the stream,
- erosion and siltation,
- accumulation of refuse or waste.

Garbage disposal in river valleys is a common form of abuse.

d) Any interest or intention of developing land in the Streamway Influence Belt requires approval from the local municipality and approval is contingent on reasonable proof that the development will not contravene the conditions set forth in this Study.

e) No intensification of land use nor any relaxation in management standards may occur for lands within the Streamway Influence Belt without municipal approval whose decision should reflect the objectives presented in an adopted management plan for the river and its shorelands.

f) A special procedure should be followed in reviewing applications for developments in the Streamway Influence Belt. This procedure should insure the development will not create health, safety, water quality or other problems relative to the selected alternative.

g) Development, as used above includes: commercial, industrial, institutional, transportation, recreation, residential and agricultural facilities, municipal utilities, cultivation, clearing, dairying, feedlots, poultry or fur farms, storage, minerals extraction, forest harvesting, and buildings or uses accessory to these.

h) Streamway Influence Belts are appropriate along all continuously flowing watercourses and all designated navigable waterways.

3. No development which generates sewage or manure may permit untreated sewage or animal wastes to enter a river or a tributary channel of a river except after being treated to the standard of primary treatment as specified in provincial health legislation, and then it may only be released to such a channel during periods of high flow in the river. Domestic sewage systems and dry pit toilets used at any recreation facility must be located beyond the Streamway Corridor and preferably beyond the floodway of the 100 year-return flood.

4. All country or seasonal residential development must conform to the appropriate standards developed for country residential subdivisions as presented in the Rural Land Use and Housing Study prepared in 1976 by the Red Deer Regional Planning Commission. Neither country or seasonal residences are acceptable within the 100 year-return floodway of a river and may only be established in the Streamway Influence Belt by permit.

5. All new campgrounds should meet or exceed the Minimum Standards for Campgrounds as prepared in 1976 by Travel Alberta. In addition to those standards, facilities developed within a campground should not be so intense as to require the alteration or clearing of more than 40 % of the total landscape.

6. Institutional developments for recreation, camping or retreat functions must meet the same standards as are required for comparable facilities in cottage subdivisions or campgrounds.

7. Agricultural operations, including livestock watering, feeding and grazing must be restricted and regulated in such a manner as will minimize disturbance to bed and bank stability, vegetation, spawning or feeding pools and water quality, or where downstream users will be given cause for grievance.

8. Land surface disturbing activities may not occur within the Streamway Corridor nor in any location or manner which results in siltation of the watercourse. Also, all disturbed areas in the Streamway Influence Belt should be restored to a condition which resists erosion and supports a new natural ecological community that is in harmony with adjacent areas.

Land surface disturbing activities may not occur at any location or in any manner which results in siltation of the watercourse.

9. Certain industrial operations require infrastructure (roads, pipelines, transmission lines, pumping stations) across, along or very near the river. These must be reviewed in the context of site conditions and operational guidelines in effect as a result of this Study and the adopted management alternative so that the requirements of the industry may be accommodated without compromising the integrity of the Little Red Deer River Management Plan.

10. All water bodies in Alberta are owned by the Crown in right of the Province and so are the streambeds and banks (to the bank-full height). These areas are public property and do not belong to adjacent private land owners. However, riparian rights (water use privileges granted without licence to shoreland property owners) are conferred in the Water Resources Act. Since both public and private privileges do exist along the streamway, it is essential that each recognize the other's rights without assuming the other is solely responsible. Since the streamway is public property, the public should carry the cost of stream and streambank management. However, since each property owner has an obligation to prevent his activities (practices, operation or property) from causing an offense, damage or hardship to adjacent property owners, (including the Crown who owns road allowances, streamways, lakes, parks, etc.), he must assume responsibility and bear the costs for providing the controls needed to prevent those hardships,damages or offenses from occurring to the Streamway Corridor along the Little Red Deer River.

11. Private property owners must not be disadvantaged or have their operations jeopardized as a result of public uses or developments for public use associated with the river and its shoreland amenities. Although tresspass is a practice dealt with in legislation, its prevalence is accelerated by increased development and increasing numbers of non-residents using a neighbouring public facility. It has already been stated that shoreland property owners are granted legal riparian rights. However, the public, who own the streamway, have no comparable rights to or benefits in adjacent private lands. Nothing contained in this Study suggests such rights or benefits should exist.

12. In the Green Area most of the shorelands and even most of the entire watershed is Crown land. Throughout this vast area the Provincial Government has maintained ultimate control through an Order in Council establishing the Green Area. The recent cabinet endorsement of an updated policy, known as A Policy for Resource Management of the Eastern Slopes, 1977 designated specific management preferences and controls for areas called "zones" throughout the Eastern Slopes of the Rockies including the headwaters portion of the Little Red Deer River. This policy paper designated the entire east slopes part of this Study area to the Multiple Use Zone. This designation allows a broad variety of natural resource uses, many of them already committed to various dispositions. Watershed and other environmental values are carefully considered in each disposition application with the intention of ensuring their long term integrity. Among the uses acceptable in this zone are timber harvesting, petroleum production, coal exploration, recreation access, regulated off-highway vehicle use, grazing and some cottage development. This Study supports and reinforces the broad allocations made in the Eastern Slopes Policy paper. However, the designation of a Streamway Corridor and a Streamway Influence Belt are superimposed over that policy.

13. There are certain locations in the Green Area where access is convenient and natural conditions are conducive for public recreation facilities near the watercourses. At these locations appropriate facilities are encouraged and the development standards suggested herein are the Forest Recreation Area Regulations and the development standards presented in this Study. Since the headwaters of the Little Red are outside the Red Deer Regional Planning Commission Area and the Provincial Department of Energy and Natural Resources is the main agency responsible for land use in the Eastern Slopes, this Study does not present a detailed review of that area.

14. Existing facilities which do not conform with these guidelines and those introduced by the selected alternative must be treated as non-conforming uses rather than as precedents.

15. The natural course of the streamway may not be diverted except as may be desirable to contain erosion at sites where its progression is causing major destruction and hardship.

Further to these general management guidelines, additional regulations are required by the management alternative selected and also by zoning.

DEVELOPMENT STANDARDS:

One of the more controversial concepts related to land development is carrying capacity. All that is really referred to when this term is presented is the greatest reasonable load that can be sustained. When used with reference to land use carrying capacity, it is different from its application to a beam or cord used to support weight. In those instances, carrying capacity is a specific load which, if exceeded, results in stretching, bending or breaking. With land use, carrying capacity has several dimensions and the breaking point (or even the bending or stretching point) is probably difficult to ascertain. For example, there is the dimension of physical space limitations; secondly there is the dimension of visual appearance; thirdly there is the consciousness of crowding; there is the capacity of natural systems to restore themselves following abuse; and there is the permissable level of alteration or deterioration. Each of these may be excessively loaded but the point at which this is seen to occur varies from one person to another. As a result, there is no specific environmental carrying capacity except an arbitrarily selected one based on generalities. These generalities are presented below as development standards.

Public Campgrounds:

In 1976 the provincial government agency responsible for tourism, Travel Alberta, prepared a statement of minimum standards for campgrounds. These standards are appropriate for campgrounds. which will be developed along the Little Red Deer River. In addition to those regulations however, it is desirable to regulate the total intensity of development at a site. The constraint used here is to restrict development in river shoreland campgrounds in the following way:

1) First of all in determining the maximum potential for development, a factor of one lot for each 10 meters of river shoreline in a unit is used for serviced and semi-serviced campgrounds. With basic campgrounds the density should be reduced to 1 in 20 meters. The reach of river measured for this purpose is along the unit considered

suitable for campground development only.

2) To ensure esthetic preservation of natural environment camping areas the density of site development should not be permitted to exceed that which will require more than 30% of the natural surface or native vegetation to be disturbed or removed in basic campgrounds. For serviced and semi-serviced developments, the intensity may require as much as 40% vegetation removal or surface disturbance.

3) All facilities for sewage handling or disposal must be at least 50 meters away from the water's edge and beyond the 100 year return flood line.

Cottage Subdivisions:

Various cottage subdivisions already exist adjacent to rivers in the region. From information gathered for this Study, they are not considered unacceptable uses of shoreland resources and, some definite concern was expressed by the public to encourage additional cottage development.

To some certain extent, this is due to a desire to gain economic benefits through the subdivision and sale of high amenity lands which do not produce major economic returns in their alternate uses. Also, this interest was evident from existing cottage owners who hope to justify the acceptability of their choice of recreational pursuits. Irrespective of either point of view, there are areas where recreational cottages used seasonally would not introduce any significantly detrimental impacts on the shorelands or the stream if reasonable standards are required. In addition to the requirements of legislation already in place, the following standards should be adopted.

1. For each cottage lot located within the Streamway Influence Belt, an average of 50 meters of shoreline should exist. This does not imply that linear subdivisions are encouraged. Rather it implies a limit to the number of total lots within the S.I.B. regardless of subdivision design.

2. Materials and design types for cottages should be strictly restricted too, so that a harmonious valley quality is retained. Given a major expenditure for a lot, either for purchase or lease, no relaxations in quality of construction should be permitted for the purposed of realizing a saving. Natural wood and stone materials finished in tones which blend well with the natural tree and ground complex should be required. As much as possible, design should compliment natural terrain rather than requiring major landscaping, and building heights should be kept below 8 meters (25 feet).

3. Main floor space should be a minimum of 60 square meters (600 sq. ft.) for a single level cottage or A-frame, but for two levels with frame walls the main floor minimum should be 80 square meters (800 sq. ft.).

4. Total vegetation removal or soil disruption for a cottage should not exceed 30% of the lot and 35% of the total subdivision. This will retain the natural character of the cottage subdivision to a large extent.

5. Any cottage subdivision developed in the Green Area should conform to the Eastern Slopes Policy and be rigidly maintained for seasonal use only. Private developments in the area should be by lease of land rather than purchase.

6. All cottages should be supplied with one of the following toilet systems. An electric toilet, a porta-potti toilet, or a standard flush toilet. These are presented in order of preference. Kitchen and bathroom waste water must be disposed of through a tile field system buried below frost level in accordance with Provincial standards.

7. No cottage or its sewage disposal facility may be established within 50 meters of the streamside although the property may extend to the Streamway Corridor.

8. No new subdivision shall be approved where any lot will be within .5 km of a certified livestock confinement facility.

9. Approval of any new cottage subdivision should require development of 75% of all lots within two years, or where fewer than 10 lots are involved, development of all lots should be required in two years.

Country Residences:

One well known country residential subdivision exists at Westward Ho and several isolated lots have also been developed. No information gathered for this report indicates country residences are unacceptable along river shorelands, if they are permitted in scenic rural environments generally. However, in keeping with the goals already presented, certain controls are needed.

1. First of all, this Study accepts the overall standards presented in the Rural Land Use and Housing report prepared by the Red Deer Regional Planning Commission.

2. Country residences are generally discouraged within the Streamway Influence Belt. However, where they can be accommodated, there must be an undisturbed preserve of 50 meters between any development and the water's edge, even though the property may extend to the margin of the Streamway Corridor.

3. For each lot approved in the streamway vicinity, there must be a minimum of 100 meters of shoreline length. Again, this does not imply a spread out linear subdivision is favoured, rather it restricts the total number of lots within the S.I.B. irrespective of subdivision design. The length of the controlling shoreline is measured along the subdivision only. Therefore, if a quarter-section parcel adjacent to the river is subdivided, there will be one-half mile of shore-

line (800 meters). Therefore, only eight (8) of the homes may be built within the S.I.B. and each of these must be at least 50 meters away from the river's edge. The intention of this standard is to preserve the natural characteristics of the valley.

4. Materials and design of country homes, particularly in the Streamway Influence Belt are required to meet the same standards stated for cottages.

5. Total vegetation removal and site disturbance should not exceed 30% of the lot.

6. This type of development is not appropriate in the Green Area.

7. No subdivision shall be approved where any lot will be within .5 km of any certified livestock confinement facility.

8. Approval of any country residential subdivision should require development of 75% of all lots within two years.

Feedlots:

At the present time, a handbook jointly authored by the Provincial Departments of Agriculture and Environment is used to regulate the feedlot industry. This handbook, titled Confinement Livestock Facilities Waste Management Code of Practice, is intended to provide the basis for ensuring careful planning, good waste management standards and the rights of others, are each considered while reducing environmental problems. However, it serves only as a guideline, applies only to new confinement facilities and is not a replacement document for other legislation. In addition to this document the Clean Water Act and regulations under the Public Health Act regulate feedlot management. Furthermore, restrictions that apply to feedlots for beef cattle also apply with equal force to confinement facilities related to poultry ranching, dairy farming or any other form of meat production. In addition to the standards required and recommended in this handbook, the following are preferred by this Study.

1. No livestock confinement facility or catch basin or lagoon associated with it may be positioned within 100 meters of a watercourse. Unless clear evidence can be presented to show that the development and operation of a confinement facility within the Streamway Influence Belt will not cause greater contamination to the stream than one established beyond it, then no such facility is acceptable in this area.

2. Disposal of animal wastes (including dead animals), must not occur within the Streamway Corridor, although they may be spread onto arable lands beyond that distance.

3. Confinement structures, catch basins and lagoons must be a minimum of .5 km from any established public or institutional recreation facility and .5 km from any established and non-affiliated country residence or cottage.

4. Confinement facilities should not be developed in the Green Area.

Livestock Watering:

Livestock watering practices are very loosely regulated. Some portions of the Eastern Slopes which supply municipal water are closed to livestock to avoid contamination, but few other controls exist along natural water courses such as the Little Red Deer River. Both where land is privately owned and where it is leased for livestock grazing, the animals (cows, horses and sheep)are watered in the streams, they trample stream-banks and generally stand around in and adjacent to the streams. During winter months, a common practice is to cut holes through the ice on watercourses to water livestock. This practice concentrates manure directly on the ice and often serves as a focal feature for feeding as well. Under these conditions these wastes enter watercourses in an untreated state. Appropriate standards for watering, unconfined livestock are therefore listed below.

1. Livestock must not be permitted to have unrestricted access to water courses. Only at locations where the streamside is stable as a result of gravel or cobbles or where trampling will not kill bank vegetation or aggravate channel siltation or bank erosion, should cattle or other livestock be permitted direct access to the stream. All sites not appropriate for direct livestock access to streams should be fenced to direct livestock movements away from them and to direct livestock toward approved shorelands.

2. Where no acceptable on-stream watering sites for livestock are available, then offstream watering ponds or troughs should be provided. These may be supplied with fresh water from springs, wells, surface runoff or from the stream by pumping. All such offstream watering facilities must be a minimum of 10 meters from the water's edge.

3. Where no acceptable natural on-stream watering sites for livestock exist, then such a site may be developed by modifying the bank and bed of the river so that a gently sloping cobble bank and bed with suitable fencing occur. Such a facility requires a development permit.

4. No new onstream livestock watering site may be developed or used where an existing facility or activity which promotes water contact recreation or extracts water for any domestic use occurs within 1 km downstream.

5. Each livestock watering site within the Streamway Influence Belt requires a development permit from the relevant Municipal authority.

6. The requirements of existing legislation relating to agricultural operations, clean water, and health must also be satisfied.

Agricultural Use:

Farmers and ranchers deserve much credit for the present good quality of the Little Red Deer River. As owners of the shorelands, much discretion has been exercised concerning natural amenity protection, often at some cost to themselves. Conversely, however, no land using industry has had so great a negative impact on the natural shoreland and stream character as the agricultural uses generally. As a result of clearing of trees, breaking and cultivation of streamside lands, grazing of woodlots, dumping of manure, fertilizer and pesticide application, and even water use, a considerable alteration in both the character and functioning of the entire river and its shoreland system has taken place. Some standards could go a long way toward minimizing and even alleviating these impacts. Such standards are fair, even though the operator owns the land. He still has a major advantage through riparian rights relative to operators without riparian rights. Also, it has to be recognized that the stream through his farm, is public property. Thirdly too, they are fair because of the consequences to downstream residents and users from inappropriate activity upstream. The following general agricultural standards are introduced.

1. Agricultural operations including livestock grazing are not appropriate within 10 meters of the water's edge. All agricultural facilities must be at least 100 meters from the water's edge, except where the valley break occurs at a lesser distance, in which case the required setback is 10 meters beyond the valley top break.

2. All changes in land use within the S.I.B. require a development permit from the appropriate authority. Clearing or breaking of land is included under this restriction.

3. No buildings associated with the agricultural operation may be erected or moved onto lands within the S.I.B., except upon secural of the appropriate development permit.

4. Where shorelands are used for livestock grazing, then the owners of the livestock are required to erect appropriate fencing to confine livestock from access to the river except as permitted by these standards.

5. Where shorelands are used for non-agricultural purposes, then the individual, agency or institution responsible for the shoreland, should fence off those lands.[19]

6. In the Green Area where grazing allotments, grazing leases or freehold grazing lands exist the owner of the livestock must assume responibility for preventing damage to fragile shoreands and deterioration of the water quality.

Institutional Developments:

The existing institutional facilities along the Little Red Deer River are to some extent similar to a combination of campgrounds and cottage subdivisions. The appropriate standards for them is therefore, a combination of their standards. The distinction comes as a result of the large dining or assembly and recreation features on these institutional camps.

1. All requirements for facilities of a comparable nature to those in public campgrounds or in cottage subdivisions are constant.

2. Except for cabins and such other buildings as have a total floor area that does not exceed 400 square feet each, any facilities developed within the S.I.B. require a permit from the relevant council.

3. Sewage handling and treatment facilities may not be located less than 50 meters from the stream.

4. Total site alteration for facilities developed in the S.I.B. may not exceed 40% of the land surface.

5. Where the river is used for recreation activities associated with the institution, then the institution must protect the shoreland from disfigurement and not permit major facility intrusion within 50 meters of the stream.

Industrial Operations - Non Agriculture

Along the shorelands of the Little Red Deer River there are instances of gravel mining, gas and oil production, pipeline installations, water withdrawal and gas processing. Each has a different nature and impact and requires different restraints. Gravel pits cause the greatest concern because they require tree removal, soil removal, lowering of the natural contour and possible permanent disfigurement. Gas plants do not occur within the Streamway Influence Belt. Pipelines tend to be disregarded once buried but production wells require much surface impact during drilling and a long term pump installation on the site. The following standards are presented.

1. No industrial activity may proceed in the Streamway Influence Belt without a development permit from the relevant council.

2. Where surface disturbance will occur the activity must be kept more than 10 meters from the stream bank. In the case of pipeline crossings these must be selected to minimize damage of the shoreland and siltation of the stream.

3. Gravel mining operations must not occur in the streambed nor in a manner which increases silt in the stream nor may the natural watercourse be diverted into or through old excavations.

4. Gravel workings must be restored to a condition which resists erosion, has a worthwhile subsequent function and is esthetically enhanced. This must proceed at a rate whereby only three year's workings or else 5 acres (whichever is greater) are unreclaimed at any given time.

5. Water pumping stations should be so designed as to take advantage of natural deep pools if possible. Where bulkheads are required to provide a small reservoir to increase the pumping efficiency, these must be designed with site amenities in mind and appropriately flagged so that floaters or paddlers will not drift into or over them. When bulkheads or weirs are installed in streamways where sport fish are common, then the design must be of a type that permits the seasonal upstream movement of these fish. Bulkheads are not appropriate in the channel through any recreation complex.

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[19] The Line Fence Act, R.S.A. 1970 C 210 must be the official authority for fencing of property.

Bulkheads obstruct passage of sport fish.

6. Oil and gas wells may not be located within 50 meters of the river nor may the cleared or disturbed site enroach onto this protected belt except along those reaches of the river where agriculture is the preferred use. Here oil and gas operations may encroach to within 10 meters of the stream.

7. In the Green Area standards for industrial operations are regulated by the Alberta Forest Service, the Energy Resources Conservation Board, the Lands Division and Minerals Disposition Division. Existing standards of practice are considered appropriate for timber harvesting, oil, and gas exploration and development and even for coal related activities. This Study further emphasizes the watershed and recreation priorities of that area and stresses the need to protect a 10 meter wide natural environment area on each side of the stream. Livestock grazing is included in this constraint.

Roads

It is not the intention of this Study to lay out a road system to service the Little Red Deer River shorelands. However, the following road and access standards are reviewed and some recommendations are presented.[20]

1. Five standards of road design are appropriate. These are: highways, secondary roads, recreation access roads, municipal roads and resource roads.

2. Highway 27 is the primary highway servicing the river and it is adequate for immediate conditions. Highway 22, from Cochrane to Cremona is of good quality and will attract growing use. Access and mobility to and from this area will be enhanced when route 922 is upgraded to form a paved extension of Highway 22 at least as far north as Highway 27.

3. Several secondary roads provide access to the Little Red. Secondary road 587 between Bowden and James River Bridge is constructed to Park Access standard as far west as the Little Red because of Red Lodge Provincial Park. Extension of the paved surface west would be desirable. Secondary road 580 between Carstairs and Cremona is paved but to a lower standard than Park Access roads. Pavement does not extend all the way to the junction with Highway 22 and it will be desirable to have this done. Secondary road 582 west of Didsbury is gravelled and less heavily used. Also, secondary road 766 which is a north-south road, is gravelled. A short gravelled secondary road also extends east and west through Water Valley. At this time all of these roads are of adequate standard, but then, if hard surfacing were provided, travel conditions would be improved.

4. Municipal roads in this region conform to the survey grid providing a road allowance each mile east-west and every second mile north-south. Every quarter-section of land has one road allowance bordering it on the north-south axis and half of the quarters also have a road allowance bordering them on the east-west axis. All of these road allowances have not been developed. Where topography and water courses have restricted land development fewer roads are graded. There has also been a general trend to avoid bridging the Little Red Deer River except where it is relatively necessary and topography is not especially difficult. This has resulted in some access deficiencies along the shorelands but has permitted a more natural shoreline condition to be maintained than where access is easier.

5. Between Elkton and Water Valley many roads and bridges are shifted from the grid system because of the steep valley sides, and few river crossings exist. Alignment along the grid is not recommended.

6. West and south from Water Valley road access is very restricted. The partially gravelled, partially clay-surfaced Harold Creek road is primarily intended for local access by ranching interests, recreation users, forest managers and operators and oil and gas interests. Use of this road is increasing, particularly for recreation access and this trend will continue. If one or two recreation areas are developed between the Trunk Road and the Green Area boundary, use of this road will escalate. In this eventuality continuous gravel surfacing would be desirable and possibly a degree of widening as well. Resource roads also penetrate this area to service the oil and gas activities there. The standards used are essentially good.

7. If the potential of the valley for recreation is exploited, there will need to be improved and increased access. Where new access is required, bridging of the river should be minimized but roads should be minimum subgrade of 8.5 meters (28 feet) gravelled.

8. Several fords occur along the river. Where these occur on gravel beds and the banks are extensions of the gravel or cobble bed, no concern is expressed. However, where these conditions do not prevail, vehicular traffic from one side of the river to the other should be confined to existing bridges.

9. Except where roads lead to a bridge over the river or to a shoreland facility, no roadway should be constructed within 100 meters of the watercourse.

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[20] See Map No. 2 for road locations.

8 LAND USE ALTERNATIVES

LAND USE ALTERNATIVES

There is no single right management strategy for an entire river valley. Possibly one scheme has advantages over others if a predefined management bias exists or if a basic policy is in place, but in most land resource issues there are several options, each somewhat dependent on a particular bias. In recognition of this dilemma the Little Red Deer River Pilot Study presents a range of alternatives from which a management plan can be extracted.

In preparing workable river shoreland management alternatives the objective is to develop distinctly different but strongly feasible options. No alternative is worth discussing if it is not practical, so four practical alternatives are considered for this Study.

A. The Conservation Alternative suggests that the river shorelands should be largely conserved so that natural conditions are not disrupted and land use practices will have very minor impacts on the shoreland character or the natural functioning of the streamway system.

B. The Recreation Alternative suggests that the river shorelands should be managed so as to maximize the use of resources which are predominantly river based and are not commonly available away from the river shorelands.

C. The Agriculture Alternative suggests that river shorelands may be used so that their potential for agriculture can be most beneficially pursued while maintaining the functioning of the river and its shorelands as a healthy system.

D. The Multiple Use Alternative suggests that the river shorelands may be developed for multiple objectives to the extent that additional use would impair the natural functioning of the river and its shorelands system.

PROCEDURE:

Map 16 is a display of the potential categories of experience determined to be most highly rated at each location along the river.[21] It is exclusively based on the ecological data gathered for each of those locations. It cannot be considered either socialogically or economically influenced. At this point none of the listed alternatives is indicated. However, the intentions described under the heading, "Selection of Categories of Experience" are basic to an understanding of what this map means. Also, even if none of the alternatives named above, are selected, all of the requirements put forward in Chapter Seven; Guildelines and Standards would influence management decisions following adoption of a plan based strictly on Map 16. In this regard Map 16 offers a fifth alternative which is open ended with respect to land use.

Once an alternative is specified however, all functions shown on Map 16 are biased in the direction of that alternative. This is most conviently demonstrated by presenting an additional matrix known as the Alternatives For Land Use matrix (see Figure 17). The approach applied in this matrix is to offer alternative management choices, not by altering the basic analysis or changing the shape and/or colouring of the designated areas shown on Map 16. Rather, this approach establishes a different orientation of development control with each alternative. As can be seen by referring to the matrix, each alternative shows certain uses as permissible, others as conditional, and others as not permitted. One alternative will permit certain uses in situations where they are not accepted if a different alternative is considered. But it is also apparent that certain uses are permitted to some degree or under some site conditions no matter which alternative is considered.

Using Figure 17 together with Map 16, the type of development for each site can be determined. Then by applying the guidelines and standards presented in chapter five, the extent and design of these developments may be made conformable and consistent. For example, for all segments of the river the Streamway Corridor and Streamway Influence Belt are considered mandatory regardless of the alternative being discussed.

Finally, provision must be made for site specific and activity specific considerations. As an example, where adjacent sites with lower suitability are needed to provide a complete facility, they should be available for that function, particularly if that function is preferred under the alternative being considered, and the health of the site will not be eroded.

So then, the alternative applied determines the functions at each site, and even though relatively high potentials may be expressed for a particular function, they may be given lower priority under a given alternative. On the following pages the four alternatives are discussed. From these descriptions comparisons can be made and preferences drawn.

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[21] The map only displays the portion of the Study Corridor that is located in the Red Deer Regional Planning Commission Area. The most detailed data were gathered for this part.

THE CONSERVATION ALTERNATIVE (Scenic River System).

> THE CONSERVATION ALTERNATIVE SUGGESTS THAT THE RIVER SHORELANDS SHOULD BE LARGELY CONSERVED SO THAT NATURAL CONDITIONS ARE NOT DISRUPTED AND LAND USE PRACTICES WILL HAVE VERY MINOR IMPACTS ON THE SHORELAND CHARACTER OR THE NATURAL FUNCTIONING OF THE STREAMWAY SYSTEM.

THE MEANING OF CONSERVATION

It is generally recognized and accepted that some activities or developments must be foregone so that other interests with higher priorities may be satisfied. When those other interests which have higher priority are desires to prevent natural or ecological deterioration, then we have conservation priorities. The overall objective of the Conservation Alternative is that the natural landscapes and pristine ecological functions of the Little Red Deer River and its shorelands be conserved. In pursuing this objective, it will be necessary to exclude activities and developments which conflict with that emphasis. Along certain reaches of the stream there may be very significant potential benefits from uses which would conflict with this objective. The obligation of the planner and the development authority then, is to see that uses are allocated so that the benefits realized from the total study area (valley) are in balance rather than attempting to maximize benefits.

Once the conservation priorities of the study area are satisfied, both locally and regionally, the availability or interests of more intensive types of land use and resource developments are considered. This being the case, the conservation objectives, when pursued, do not preclude the parallel pursuit of such activities as recreation, agriculture, and commercial or industrial development. But these will not be acceptable except as low impact, non-degrading uses.

The Conservation alternative will protect pristine landscapes.

GOAL AND OBJECTIVES OF THE CONSERVATION ALTERNATIVE

The goal of the conservation alternative is to provide a mechanism which provides sufficient protection for the river and its shorelands so that their natural functioning will remain either largely natural or that the basic components of the river system maintain their natural characteristics. To realize this function the following management objectives are presented:

1. To conserve the watershed so as to provide a reliable supply of clean water for aquatic habitat and downstream users.

2. To retain the natural character of the shorelands to the extent necessary for the components of the river system to function in a natural way and to maintain conditions suitable for wildlife propogation.

3. To maintain the esthetic quality of the stream and valley side landscapes so they continue to display qualities which are unaltered.

4. To restrict the development and use of the river and its shorelands from uses that inhibit or conflict with the above goals and to restrict operations or practices which negatively impinge on the water quality or shoreland soil stability.

5. To guide and direct the development of those resources which occur along the river while minimizing conflicts with the above goals and to designate appropriate sites for intensive use facilities.

6. To encourage the continued use of agricultural land for agricultural production within such constraints as are necessary to maintain good water quality and stable soil and avoid altering the functioning of any basic component of the natural river system.

7. To take corrective action to restore present or past situations of ecological abuse to a condition where they no longer negatively influence the functioning of the river system.

ASSUMPTIONS:

The following assumptions serve as a basis for decision making using the conservation alternative:

1. Highly fragile areas will be protected. Operations causing surface disturbances must not be carried on there.

2. A combination of remoteness and absence of development provides a natural refuge for wildlife. Unless such refuges are available, some species cannot thrive. Such areas also provide settings for human solitude and such outdoor recreational activities as do not require the services and trappings of civilization. These situations should exist in the vicinity of settlement as well as in remote recesses of the back-country. River valleys provide natural linear extensions of such conditions far downstream of their upland counterparts.

3. Each specially managed area must be large enough so it can adequately serve the function intended, but need not be so large as to include all of the area having those conditions. Also, it is not always necessary to rigidly protect areas which have sensitive features, particularly if representative areas are protected elsewhere.

4. Facility and road development will receive relatively low priority except after all preservation priorities have been identified. The desire to derive economic returns directly

from the area would be a low priority.

5. Certain types of uses which now occur along shorelands cause excessive impacts. No more of these uses can be accommodated. Other uses would be monitored to detect any possible damages to the integrity of the watercourse.

6. Shoreline vegetation removal will be restricted along the entire length of the river.

7. An expanded use of the river valley by wildlife would be pursued.

8. Some land along the valley would be brought into Crown ownership to increase public use opportunities and to extend habitat preservation opportunities.

9. Activities which concentrate people or activities will be accepted only after preservation objectives are satisfied.

10. Water quality will be protected.

11. When the conservation objectives and the assumptions related to conservation of the river valley are fully expressed, they define a Scenic River System.

THE RECREATION ALTERNATIVE

THE RECREATION ALTERNATIVE SUGGEST THAT RIVER SHORELANDS SHOULD BE MANAGED SO AS TO MAXIMIZE THE USE OF RESOURCES WHICH ARE PREDOMINANTLY RIVER BASED AND ARE NOT COMMONLY AVAILABLE AWAY FROM THE RIVER SHORELANDS. Based on the following discussion this alternative is seen to constitute a RECREATION CORRIDOR.

WHAT A RIVER VALLEY IS.

Rivers are not products of their local situation. This is fairly obvious but needs emphasizing. Rivers are products (or evidence) of conditions which occur upstream and across the watershed. The existence of a deep, broad trench with a continuous supply of fresh, flowing water in its channel, and this extended across the landscape, is not a situation which has developed in response to conditions in the immediate vicinity of those features. Rather, the rivers exist because surplus water at high elevations is pulled downslope by gravity. As it flows, its action erodes away the land to shape a river valley. The very long term product is a major geographic feature supplied with water, local relief and usually trees, and this condition occurs anywhere from the high elevation headwaters in the system across parched deserts to the ocean shore,where it all ends. So, although a region may be otherwise devoid of relief, water or vegetation, and has a local climate which essentially precludes their natural establishment, the presence of a major watercourse across that region often provides these elements.

THE RESOURCE BASE FOR RECREATION.

Three resources are basic to a dynamic recreation landscape. First of all, proximity to water adds more than any other single factor to the magnetism of an area for recreational purposes. Also, of major significance, is the overall topography. Unless there is some variation from the area-wide terrain and especially, unless there is local variety and relief, the attractions afforded by a site are generally deficient and may often be described as mundane. Thirdly, where there are trees and therefore where the sense of seclusion and privacy, and opportunities for shade are enhanced, recreational pursuits are more commonly evident.

Water

The strong orientation of recreators to water is evident primarily along lake shorelands. The heaviest concentrations of people seeking natural environment recreation experiences are found at beaches. There they can swim, wade, go boating or fish or simply relax beside the water. Other appeals of the lakeshore are picnicking, camping and cottageing. Each of these activities are also potentially possible where rivers and their valleys have appropriate characteristics. Water attracts people, whether that water is flowing or still, even if just to watch it or skip stones across its surface.

Local Relief

Western Alberta is better known for its mountains and foothills than for any other natural attraction. The bulk of the travelling tourists gravitate to the mountains, because of the variety of scenery offered by the continuous presence of mountains. The expanses of uninterrupted prairie along eastern Alberta attracts nowhere near the attention focused on the mountains. Even the forested, but low lying or gently undulating terrain of north-eastern Alberta has not caught the attention of people as the mountains have. Were it not for the lakes, with their high quality beaches, it is doubtful if north-eastern Alberta would attract anywhere near the numbers of people it now does. Unless there is a conspicuous topographic situation evident, it is doubtful that either water or trees strongly attract people. Two examples outside of the mountains are, the Cypress Hills with trees and hills, and the badlands with topography and water. The interesting aspect surfacing from the foregoing discussion is the realization that rivers almost always flow in valleys which are carved into the surrounding terrain. These valleys present distinct, and sometimes dramatic local relief and variety compared to the landscapes beyond the valley sides.

Trees

Whether people go camping, walking, fishing, golfing, horseback riding, cottageing, driving or hunting, they tend to primarily gravitate towards forested areas. Even when boating or canoeing, the appeal of the treed shoreline concentrates people relatively close to the water's edge. There is something about a leafy canopy overhead or a surrounding berm of foliage which enriches the outdoor experience, even if those trees are not a direct contributor to the recreational activity. People plant tree belts along city boulevards, in their front and back yards, in containers on sidewalks in enclosed malls and even within their homes. Without trees, a setting does not "feel" complete. Trees provide a very large measure of the natural appeal in the mountains, the foothills, the north, the lakeshores and the otherwise monotonous plains. Besides these locations however, trees are the most common feature of river systems besides the water itself. River valleys are literally extensions of the forests along linear corridors which stretch across the prairies.

From the comments presented in the above paragraphs, it can be realized that river environments generally contain the three essential natural amenities around which outdoor recreation activities and facilities are oriented. The only additional natural element which is universally relevant is climate. Obviously, the river valleys present climatic conditions comparable to those experienced at neighboring lakes, uplands or plains.[22]

RECREATION DEMAND

Without question there is a growing awareness of and active participation in numerous types of outdoor recreational pursuits. These pursuits are progressively being indulged in by an ever broadening spectrum of society as people seek for new ways to use their leisure time, spend greater amounts of discretionary income and experiment with the influx of innovative recreational equipment. There is not only a growing population seeking recreational playgrounds, but a larger number of people in existing populations are regularly getting out into recreation areas. The demand for such areas is therefore quite intense.

A Rural - Urban Clash

Paradoxically, the growth in population is occurring in urban areas while popular recreation areas are in rural settings. Rural populations are either constant or increasing very slowly so, to a large extent, the rural resident feels he is being exploited more and more by urban residents. This is probably an unjust assumption in the truest sense. Although there is an ever increasing number of urban recreators in the countryside; it is also significant that, even what rural population there is, now indulges in recreational pursuits at an intensity which parallels his urban counterpart.

Meeting the Demand

Earlier it was demonstrated that river valleys possess the basic ingredients for outdoor recreation. It can therefore be concluded that, although the general attributes of a region do not provide an appealing recreation base, if a river traverses that region, its shorelands do lend a measure of recreation appeal to it. Depending on the diversity and richness of the river's features, the recreational appeal may be very significant. In the County of Mountain View and the south-central part of the County of Red Deer few examples of high capability recreation sites exists. But along the rivers, of which none exist east of the Little Red Deer, some excellent recreational sites occur. The Little Red Deer, in particular presents numerous such features. Away from the river a combination of cleared and cultivated agricultural land, fairly routine topography, and a considerable distance to other water bodies is a fact of life. In this context, the valley of the Little Red Deer River affords the highest quality conditions for outdoor recreation within a reasonable distance. And yet, besides its recreational attributes (water, relief and trees) the Little Red seems to offer nothing that is not available in similar quality away from its valley. For these reasons, this alternative, which focuses on those particular qualities of the river system not duplicated away from the river, is really a Recreation Corridor option. Following from this overall conclusion, the function of this alternative is to prepare a plan which will allow the recreational potential of the river to be suitably utilized.

If a river traverses an area, its shorelands enrich that area's supply of recreation resources.

GOAL AND OBJECTIVES OF THE RECREATION ALTERNATIVE

The essential goal of this alternative is to provide a framework which will allow the recreation potential of the river to be suitably utilized. This broad function is reinforced by a number of management objectives.

1. To protect the habitat of wild animal populations and to retain the natural valley condition to the extent that it will contribute to the total recreation character of the stream corridor.

2. To maintain the esthetic quality and recreational potential of stream and valley side landscapes and to prevent contamination of the water in the river.

3. To permit access and facility development which will enhance public observation and use of natural scenic and recreational amenities along the Little Red Deer River

4. To restrict the development and use of the valley from such uses as inhibit or conflict with the recreational activities and facilities appropriate in the valley, even where significant benefits could be realized from those uses.

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[22] The vegetation community present in river valleys is unlike the general vegetation present on the adjacent uplands because of micro-climatic and moisture differences which occur in the valley. Different amounts of solar radiation are received at each escarpment face as a result of shifts on the orientation of the river and resultant differences in exposure to the sun. Temperature, humidity and seasonal timing, as well as the level of evapotranspiration is influenced by these differences and each produces a response in vegetation. Warm, dry, south and west facing slopes tend to have grass covers such as is found on prairie landscapes, while north and east-facing slopes are usually overgrown with trees characteristics of the boreal forests. Also, the high levels of soil moisture and periodic flooding along stream sides results in the persistent growth of willows, alders and balsam poplar in these locations. Less moist conditions would otherwise tend to support the aspen poplar.

5. To restrict operations, practices, or activities which negatively impinge on the water quality, shoreland soil stability or recreation amenities of the river and its shorelands.

6. To guide development of the resources of the river for such non-recreational interests as exist but which do not conflict with these objectives and to designate appropriate nodes for developed commercial, industrial or residential facilities.

7. To resolve conflicts between recreation facilities or pursuits and other forms of land use in a manner which gives preferences to recreational use.

ASSUMPTIONS:

Although a decision may be made favouring the utilization of the shoreland resources by functions that cannot be realized away from the river, some broad assumptions need to be stated so that managers and users will appreciate the specific conclusions. Even though recreation may be optimized along the river, every site capable of supplying some recreational benefit need not be retained for recreational use. Therefore, adoption of the recreation alternative does not imply a continuous recreation corridor would be established along the river. The following assumptions are presented to clarify this and some other aspects of the recreation concept.

1. River shoreland areas with superior potential for recreation activities ought to be maintained and managed so their amenities may be enjoyed.

2. Withholding land from commercial and industrial activities so that recreation benefit may be safeguarded and experienced is recognized as proper management along river shorelands. This is not to imply that all areas posessing recreation qualities should be equally shielded from alternate activities.

3. By applying proven treatment processes, it is possible to enhance the conditions upon which recreation is dependent at certain locations. Enhancement treatment may focus on the resources themselves or on factors affecting the resources. This assumption does not imply that major alterations to the natural character of a site may be attempted in order to create a recreation resource where no natural recreation capability is evident.

4. An area selected for a specific function must be large enough to serve the function it is selected to serve. It need not be so large as to include the entire area having the characteristics required, nor need every area possessing those characteristics necessarily be allocated to that function, particularly if it also has capability for an alternative use.

5. Providing access to high capability recreation sites situated in remote locations is an appropriate answer to the demand for recreation,particularly when accessible sites lack natural amenities and when developing the remote site will have few negative impacts on other amenities of that general location.

6. All demands for recreation facilities from people living within the possible user radius of the Little Red Deer River need not be met by the resources of this river. It is preferable to have low density use of high quality facilities rather than force a high density of use on these facilities and induce a progressive deterioration of the resource. Also, as demands are demonstrated for additional facilities it is preferable to provide them rather than allow crowding in existing facilities and indirectly encourage a spillover onto adjacent or nearby areas designated for non-recreational uses.

7. Facilities for recreation should largely be developed by the public sector for public use. Rivers are a public resource and so the natural features that have developed in response to the presence of the river (topography, tree cover, and a shoreline) all of which constitute a recreation resource, should be managed for the greater public good. However, where the private sector is willing to provide resource based recreation facilities, then a high proportion of even these should be available to public recreators.

8. In order for the public sector to assume the role of developer for recreation sites along the river valley, purchase of private shoreland by the Crown or municipality is required. This is an option which should be acknowledged and pursued, not with disregard for present land owners, but for the purpose of relieving excessive pressure and dissipating problems of trespass.

9. A high percentage of present demands for recreation facilities is from motorized travellers using tents, tent trailers, travel trailers, vans and motorhomes. These greatly exceed the number of cottages or second homes and result in pressures in excess of the accommodating capacity of existing campgrounds. In recognizing these trends, a first order priority among recreation facilities is seen to be campground development.

THE AGRICULTURE ALTERNATIVE

THE AGRICULTURE ALTERNATIVE SUGGESTS THAT THE RIVER SHORELANDS MAY BE USED SO THAT THEIR POTENTIAL FOR AGRICULTURE CAN BE MOST BENEFICIALLY PURSUED WHILE MAINTAINING THE FUNCTIONING OF THE RIVER AND ITS SHORE LANDS AS A HEALTHY SYSTEM.

THE ESSENTIAL ROLE OF THE RURAL AREA

It can be argued that the essential role of the rural area is agricultural production. Other land uses should be of secondary importance and some uses (especially the more urbanized types), should not be permitted in rural municipalities. As world food demands increase, it becomes evident that effective and efficient uses must be made of valuable agricultural resources[23] As the world population continues to expand there will have to be a parallel increase in total food production, although the overall supply of land cannot be enlarged. The solution therefore rests in increasing production from existing farm land.

As alternate developments (residential lots; industrial operations including factories; warehouse; processing plants and mines; roads and recreation areas) occupy and sterilize increasing amounts of productive lands, there may even be an actual decline in total productive land. The importance of planning the ongoing pattern of land use in the countryside is clearly demonstrated by these considerations.

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[23] 23. Fenwick, P.D., Rural Land Use and Housing, Red Deer Regional Planning Commission, August 1976, p.1

In addition to the food producing capability of fertile soils, agricultural land provides a livelihood for the farmer, rancher, dairyman or sheep herder who owns it. As the agricultural operator labours at making the land productive, he is personally rewarded or paid by the sale of products harvested from the land. He labours on and harvests from the land. The amount and quality of the land and the intensity and nature of his labour together determine the level of economic benefit he will realize.

GOAL AND OBJECTIVES OF THE AGRICULTURE ALTERNATIVE

The goal of the agriculture alternative is to allocate use of resources along the Little Red Deer River Shorelands in such a manner that the agricultural potentials are realized to their most rational extent. To amplify the intentions of this goal several objectives are also given.

1. To recognize the traditional tenure of the agricultural industry in the rural scene and guide decision making concerning rural shoreland resources so that agriculture will continue to be an integral part of their benefits.

2. To identify areas where various forms of agriculture may be pursued and determine what forms and locations of existing agricultural activity are not desirable.

3. To recognize and maintain the esthetic attributes of the rivershore landscapes and to protect the watercourse from pollution or any other damage which causes hardship to aquatic life or downstream users of the water.

4. To offer positive solutions to the problems which exist or develop because the river and its shorelands are public domain with recreational appeal for resident and non-resident recreators, while the backshore lands are privately owned, and mainly productive farmlands.

5. To accommodate non-agricultural uses along the river in locations and in a manner that recognizes the natural capabilities of the resource for those users but that favours agriculture where clear options are evident.

ASSUMPTIONS:

Before proceeding with an account of how the river shorelands are to be allocated under this alternative, it is necessary to put forward the principles on which choices are based. Both broad and narrow management choices are anchored in generalizations that many people take for granted, but which should be clearly stated so that minimal confusion will be introduced later on. These generalizations or principles are referred to here as assumptions.

1. Established patterns of land use should not be interfered with, except when clear evidence is available to demonstrate that they are causing unjustified problems or they are no longer producing benefits.

2. Food production cannot be equated with the satisfaction of leisure interests or the desire to work. Without food mankind can neither recreate nor work. Therefore, land capable of producing food should not be managed so that its agricultural potential is impaired. Also, managing productive land for either recreational benefits or for employment benefits (industry or commerce) cannot be justified when food production is needed.

3. Food production is as much an economic activity as food consumption is a social activity. Neither activity is completely pursued because of need or lack of alternatives. Oversupply of food results in excessive consumption and waste (largely because of low cost). While such conditions exist, the allocation of lands to agricultural use when alternative demands are high is not entirely justifiable.

4. In planning for resource management along shorelands all decisions must be qualified by the high prioirty concern to maintain and if desirable, to improve the water quality and flow reliability of the stream and to prevent soil erosion.

5. While agriculture is best facilitated by extensive fields with gentle topography and regular margins, river valleys offer confined spaces, steep slopes and very irregular margins. But while river shorelands offer less than ideal conditions for agriculture, they do supply excellent conditions for some non-agricultural functions.

6. Existing and potential agricultural uses along shoreland locations should not be stifled simply because those uses are not dependent on their shoreland or valley location, even if an alternate function that is dependent on a shoreland or valley location is possible at that site. Where title to rural shoreland is privately held and the owner wishes to pursue his agricultural interests, he should not be denied his rights to do so except to maintain or enhance the streamway's function of supplying benefits to both owners and non-owners of its shorelands.

7. Since the income earned by a farmer depends very much on his skills, the intensity of use and the management practices he applies, it is in his best interest to maintain the best possible soil conditions. If his errors impair the productivity of his land, his own potential to earn an income suffers. However, short term benefits can sometimes be enhanced by overly intensive use and extending the operation onto marginal areas. Often the resulting costs for such excesses are experienced by the next generation or else by off-site operators.

THE MULTIPLE USE ALTERNATIVE

THE MULTIPLE USE ALTERNATIVE SUGGESTS THAT THE RIVER SHORELANDS MAY BE DEVELOPED FOR MULTIPLE OBJECTIVES TO THE EXTENT THAT ADDITIONAL USE WOULD IMPAIR THE NATURAL FUNCTIONING OF THE RIVER AND ITS SHORELANDS SYSTEM.

THE MEANING OF MULTIPLE USE

Multiple use has been described as being the regulated use of land for that combination of uses which realizes the greatest net benefit.[24] Various other phrases are used to explain this concept, but most land use planners and managers understand it to imply that each use is evaluated relative to the benefits it offers and the impact it has on other uses at the same or adjacent locations. Generally speaking, existing uses are shielded from conflicting new uses, but there may be instances where the existing use may either be discontinued or else restricted in size in order that another use considered to offer greater net benefits, may be established.

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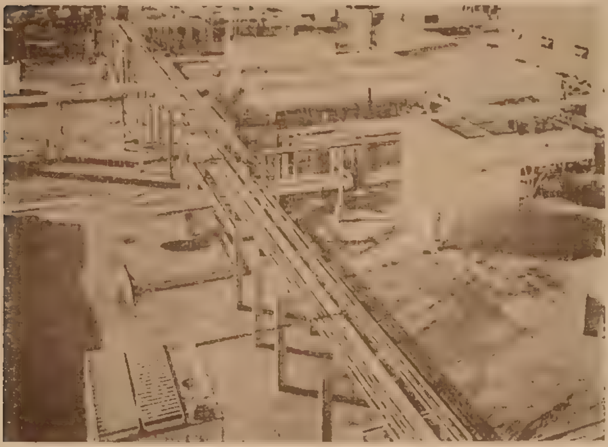
[24] Nowicki, J.J.: The Foothills Resource Allocation Study, Phase 1, 1973, administered by the Alberta Forest Service but conducted under the Canada Land Inventory Program.



Multiple use does not imply that no priorities exist or that all uses capable of turning a profit are likely to gain approval. First of all this alternative retains the concept of a Streamway Corridor, as well as a Streamway Influence Belt. As a result some activities and development must be shifted back from the waters edge and some right out of the valley. Furthermore, by accepting the Streamway Corridor, there is a concession made in the direction of preservation and public domain. Also, based on logic alone, benefit generating uses which are stream dependent will be more favourably reviewed than those uses which would use the stream and valley only as features of secondary significance.

GOAL AND OBJECTIVES OF MULTIPLE USE

The goal of the Multiple Use Alternative is to schedule the use of resources along the river and its shorelands so that their multiple benefits may be realized without granting preferred concessions to any particular use type. A number of management objectives clarify this goal.

1. To recognize and maintain the esthetic attributes of the rivershore landscapes, to select management requirements needed to realize reasonable recreational benefits from them, and to prevent the watercourse from experiencing pollution or any other damage which causes hardship to aquatic life.

2. To designate nodes of single use priority and develop acceptable guidelines for their management.

3. To encourage the use of arable land for agricultural purposes.

4. To establish use complexes which fit the resource base and constitute an integrated management unit.

5. To guide development so there will be a balance between the several beneficial functions and minimal conflict either between or among units as well as a rational sequence of change along the valley length.

6. To offer positive solutions to the problems which occur where the uses made of adjacent lands cause hardship.

ASSUMPTIONS

As with any simply labeled strategy, the Multiple Use Alternative needs to be more elaborately described to avoid misconceptions. The desire to maximize the multiple benefits attainable from river shorelands does not give any individual or agency liberty to exploit the resources found there with blatant disregard for the basic principles of good land management. The Multiple Use alternative is presented as a rational compromise approach which meets the numerous needs and aspirations of people and impinges on the shoreland system. In order to adequately explain this concept, several assumptions need to be understood.

1. Maximum benefits from any one resource or for any particular user group is not synonymous with maximum or even optimum benefits for the subregional community from which that resource is obtained or in which that user group resides.

2. Carrying forward from the previous statement, it is probable, while overall net benefits are maximized, that the benefits from any one resource, any one unit, or for any one user group will be less than maximized.

3. While multiple use suggests an integrated combination of activities and developments where demands are brought to bear on resources, it does not imply a corridor of continuous and complex land use, nor even a continuous pattern of integrated uses.

4. Although a strong case is made for the need to accommodate and ecourage agricultural production, the multiple use concept must make fair provision for alternative pursuits particularly on lands where agriculture is only one of several local possibilities. Examples of alternate possibilities include gravel mining, minerals development or processing, wildlife habitat, recreation areas, roadways and, perhaps residential use. The priority given to any of these options must be individually assessed by reviewing the soils productivity rating together with the quality of the alternate resource and the relative demands on each.

5. As long as the relevant study area is shoreland any recommendation or decision pertaining to its management or use must be qualified by the first priority concern to maintain and if desirable, to improve the water quality and flow reliability of the stream and to prevent soil erosion. Of somewhat lesser significance, the habitat needs of wildlife must assume major prominance along river valleys.

6. Since river valleys tend to extend the forested hillside features of the foothills eastward across the prairies they provide a local diversity and uniqueness in the landscape. With their usual combination of fresh water, local relief and tree cover, the most basic components of a recreation place are available. Unless superior alternate recreation places are available within the user area, then the recreational potential of the river valleys becomes very important in land use decisions.

7. Development of an area's natural resources does not automatically imply ecological impairment. Some

forms of resource use provide definite benefits to some components of an ecological community. Timber harvesting can enhance ungulate habitat and avoid infestation of the forest with pests, disease or even decadence. Clearings also improve the efficiency of snow retention. Agricultural use of land also benefits ecological conditions in some respects. Certainly, it is not always damaging. Because cultivation requires relatively flat land, erosion is not usually severe. Because productivity must be maintained year by the year, the operator seeks to maintain the best possible soil conditions, his errors are most costly to himself, not the next generation. Also many lands used for agricultural purposes require no structures and these lands, whether cultivated or grazed can be reverted to largely natural conditions quite readily and no major impacts would be evident.

Alternatives for Land Use Matrix

Alternative	Uses / Preliminary Allocation	Habitat	Trails	Basic Campground	Unserviced Campgr.	Semiserviced Campgr.	Serviced Campgr.	Institutional †	Commercial †	Cottage	Country Res.	Grazing	Cultivation	Clearing	Indust. Infrastr.	Roads	Hamlets	Feedlots	Weirs & Pumps	Gravel Pits	Non Motorized Rec.	Snowmobiling	Timber Harvesting
Conservation (Scenic River System)	Preservation	P	P	P								C									C		
	Passive Rec.	P	P	P								C									P	C	
	Active Rec.		P	P	P							P		C		C					P		C
	Agriculture *	P	P									P	C	C	C	C		C	C	C	C	P	C
	Development ✱		C		P	P	P	C	C	C	C	C	C	C	C	P	C	C	C	C	C	C	C
Recreation Corridor	Preservation	P	P	P	C							C		C							P	C	
	Passive Rec.		P	P	P	P	P	P	C			C		C		P				C	P	P	
	Active Rec.		C	C	P	P	P	P	P	C	C			C		P					P	C	
	Agriculture *		P									P	C	C	C	P		C		C	C	P	C
	Development ✱		C			P	P		P	C	C	C	C	C	C	P	C	C	C	C	C	C	C
Agriculture	Preservation	P	P	P								P	C								C		
	Passive Rec.	P	P	P	C							P	C	C				C		C	P	C	C
	Active Rec.		P	P	P	C	C	C	C	C	C	P	C	C		C		C			P	C	C
	Agriculture *	P	P									P	P	P	C	P		C		C	C	C	P
	Development ✱		C		P	P	P	C	C	C	C	C	C	C	C	P	C	C	C	C	C	C	C
Multiple Use	Preservation	P	P	P								P	C								C	C	
	Passive Rec.	P	P	P	P			C	C	C		P	C	C	C	C		C		C	P	P	
	Active Rec.		C		C	P	P	P	P	C	C			C		P		C			P	C	
	Agriculture *		C									P	P	P	C	P		C	C	C	C	P	P
	Development ✱		C		P	P	P	C	C	C	C	C	C	C	C	P	C	C	C	C	C	C	C

* Includes extensive economic activity and cultivated areas beyond the streamway influance belt

✱ Includes intensive site development and existing developments.

C Means the use may be restricted or unacceptable depending on site conditions.

P Means the use is permissible.

† Mean overnight accomodation for outdoor recreation

Figure 12

9 SUMMARY

SUMMARY

GENERAL REVIEW

The four alternatives for managing river shorelands are each realistic options for implementation. As is evident from a study of each, no shoreland management strategy which would jeopardize the integrity of the streamway is acceptable. The first consideration in every land use review is the potential impact on the streamway.

Each alternative attempts to provide the highest quality of experience possible at each site. The bias emphasized in each alternative is different but there is a consistent application of the bias along the river. This seems to be appropriate since it avoids an ad hoc approach and fosters a consistency and predictability from unit to unit.

None of the alternatives are so self sufficient or all inclusive that revisions in any part will invalidate the rest. Perhaps the ultimate management plan for the river will be a blending of parts of all four alternatives. This is possible by choosing a particular alternative for each region, subregion or river reach. This is not to imply that favouring one particular alternative for the entire valley is discouraged.

These management alternatives have been prepared to assist land owners, county councils, improvement district administrators and technical planners to evaluate the choices. It is intended that all portions of the reports will be critically reviewed and then responses will be fully evaluated. Thereafter a management plan statement can be prepared.

Much of the central part of this report deals with the procedures used to organize the Study and gather information into a manageable form. Also the evaluation procedures used to establish the individual use possibilities and limitations are presented in detail and to the possible confusion of the reader. The reason behind this detailed methodology presentation is so that you, the reader will have full access to the process and thereafter be able to offer suggestions for its improvement. It is also presented so that other river shoreland planners may evaluate it and revise it themselves or apply it, as is, to rivers in their own regions. Most of all however, it is included so that provincial and regional planners may debate it as a possible model for future river shoreland planning standardized across the entire province.

EVALUATION OF THE METHODOLOGY

To conclude this Pilot Study on river shoreland planning it is appropriate to present a brief assessment of the procedures developed for application to the Little Red Deer River. This is done so that the author's views of these procedures may be available to readers of the report and his knowledge of the procedural strengths and weaknesses will not be obscurred by, what may appear to be uniformly strong (or weak) sequence of procedural steps. To begin this assessment, the approach and inventory are discussed and the evaluation itself is later discussed.

The Approach:

a. Rivers are composed of a regular and predictable set of features.

It is most helpful to recognize and study the continuous pattern of features which constitute a river system. From the center of the stream channel to the watershed divide there are distinct natural boundaries which separate the stream process features. The channel, the streamway, the floodplain, the valley and the watershed are each distinctive and relate differently to the watercourse itself. Conditions and activities in each of these areas influence the stream in a different manner and to a different intensity. Also, the action of the stream, or the implications of its presence have a different bearing on each of these features. Conditions on the left shore of the stream may differ from conditions on the right shore due to exposure, slope, isolation and ownership.

The truly critical band along watercourses is not necessarily any of the features named above. Rather it is that shoreland band wherein activity has a strong influence on the watercourse itself. It also includes that part of the watershed on which activities or uses are influenced by the presence of the watercourse. Such a band of influence is extremely difficult to define, but in this work it is given the name, Streamway Influence Belt. From the point of view of the riparian land owner, this area could extend to the limits of his property, while for the water dependent wildlife it may be confined to the floodplain. The limits presented elsewhere in this report are considered meaningful and adequate although not directly related to natural physical boundaries such as are available for the features mentioned above. For broad shoreland analysis, the Streamway Influence Belt would present a simpler framework than the streamway, valley bottom and sides, and upland areas used in this methodology.

A second but more critical shoreland band is the immediate shoreline fringe and the stream channel. It is the area most directly responsible for and responsive to changes which occur in the stream character. The natural geo-hydraulic and biologic processes and functioning of the river system are directly linked to this band. It is called the Streamway Corridor. The streamway corridor should be used as a basic feature for inventory and analysis of shorelands.

Although the river channel is a part of the streamway corridor, a more detailed analysis is possible if it is recognized as a separate, third order feature as was done in this work.

b. Rivers can be divided into a hierarchy of segments.

In this Study a whole hierarchy of river segments have been identified and discussed. This hierarchy has not proven to be particularly useful in carrying out the analysis, other than forcing the planner to familiarize himself with the river. Arising from this process, however, it has become apparent that river shorelands should be planned as a continuous linkage of segments, and that the distinctive segments can be studied individually. It has not been found particularly helpful to identify channel patterns (meandering, fixed, braided), since the distinctiveness of these along this river is not clearly pronounced. Still it is recognized that, where channel patterns are distinctive, such as will occur in other rivers, conditions between these should not be compared directly. Along the Little Red Deer River the greater distinctiveness diplayed is between the Green Area and the White Area and this distinction is based more on topography and natural vegetation as well as ownership.

Further to this assessment of river segments, the actual process of carrying out the Study reinforces the desirability of studying the entire length of the river. Still, it seems sufficient evidence is available from this experience, to suggest that an inability to tackle the whole river is not reason to ignore a particular segment of it. A general familiarity with upstream and downstream conditions is sufficient to allow detailed planning for short intermediate segments. However, such an approach would not permit priorizing segments of the river.

The Inventory

c. River characteristics can be rated according to their degree of expression.

Various inventory procedures can be used, some with considerable exactness and others with a large measure of subjectivity. Some careful consideration must also be given to the level of detail with which the inventory is conducted. As is evident on the matrices presented on Figure 8, this Study has taken the detailed approach. Still, a great deal of generalization is involved. For example Figure 8 does not register the left and right banks separately, nor does it permit a clear registration of the variability which is noted along the length of the river within a unit. These variations and differences become very apparent when a shoreline inventory is conducted either on foot or from a canoe. To a large extent they are also apparent from an air photo analysis. Still, the need for this detail must be balanced against the level of planning being done.

Any attempt to map detailed bio-physical features leads to eventual frustration or a willingness to compromise. This is because it is impossible to show the detail available on the ground on any mapping medium because of scale differences and a lack of dimension. Maps 9, 10 and 11 are perhaps the closest approximations to an exact inventory. They are actual photographs of the Study area enhanced with interpretive information. But even they fail to fully convey the character of the terrain. So, although a lot of detailed data have been assembled and some complex methods of storing and sorting them are used, some further effort or thought should go into the whole process of data inventory and rating of characteristics. The writer is satisfied that the information has been assembled painstakingly and in depth, but is not yet satisfied that the most efficient storage and manipulation process has been developed.

Also, the systematic approach used to evaluate conditions in each unit is considered vital. The four point ratings of magnitude used and the careful consideration of each parameter makes it possible to apply standard formuli when the evaluation is done. It may be found desirable for future studies of rivers to expand the number of rating categories within some of the parameters to increase the accuracy. In other instances it may be considered desirable to split an existing parameter into two or more which are more specific. Others may be grouped.

Finally, it is appropriate to comment on the inventory of, what this writer calls, eco-esthetic characteristics. That is, ecological conditions or features which are appreciated esthetically rather than economically or quantitatively in a physical sense. They stimulate the socio-mental/emotional part of our senses. In as much as each person responds differently to these phenomena, they have variable significance. However, rather than do a lot of complex research to determine response trends to these features, a general and standard interpretation by the researcher was considered adequate. Although a range of opinions may exist regarding ratings of some of these features, the subsequent steps in the analysis provide ample room and flexibility to accommodate all probable biases. In the end, a compromise must be reached or no consistent strategy can be implimented.

The Evaluation

d. Characteristics can be grouped into categories of expression.

To some, this step is the most difficult portion of the methodology to understand or to appreciate. However, it is presented as a means of reducing the bulky magnitude values on Figure 8, down to a few (ten) broad categories with relevance to management and to the total understanding of a unit. Again, there is nothing about this list which defies revision nor is the assignment of characteristics to these categories rigid. In order to refine these assignments it would be useful to have this part of the methodology carefully and critically reviewed by a panel of resource planners and other experts so that its oversights might be adjusted. For some it may seem preferable to eliminate this step completely and go directly from the ratings for characteristics to the type of use.

e. Land use potential can be determined by merging the expression values.

Such weaknesses as are present in this part of the methodology are not so much in the procedure, but in the information available for use in the procedure. However it is interpreted, there is a great deal of difficulty in establishing the suitability of an area for a full range of use possibilities. Two problems were immediately evident when this step was completed. First of all, the totalling of so many values, some having positive and some having negative values results in the overall totals being very similar to each other. As a result comparisons between units became difficult, and establishing the level of significance that should be given to individual scores was almost problematic. Secondly, there was no quantitative way to compare scores between the various types of use (experience). This resulted in the development of Percent of Mean values which offset both of the above problems. However, this weakness in the methodology may be more significant than is apparent here. One possible way of reducing the problem may be to revise the fourth step by altering some of the Form of Expression categories and having all characteristics show a positive relationships to them. This would result in a larger spread between scores for the various units.

Alternatives:

Alternatives were considered preferable to preparing a single recommended strategy. But it proved a very difficult chore to select a set of alternatives which adequately represents the choices people wish available to them. Also, the orientation of the alternatives had to be determined and the differences between each had to be meaningful but practical.

In settling on the four alternatives used in this study, a combination of the "preservation through intensive development sequence" is blended with the "type of land use sequence". The end product is a sequence having a form and intensity of development option at either end of the sequence and two priority land use types in between. The four options given are capable of accommodating all the management and use interests possible. Few obvious weaknesses are seen in this range of alternatives.

Some criticism may be directed at the seeming contradiction of uses permissible in each alternative. It is not common to consider development in the context of a conservation plan, but this Study shows it to be appropriate. There is a need to recognize that a conservation plan can be pursued without eliminating either existing development or preventing discreetly located and managed future development. It is equally difficult for some to accept a provision for areas of preservation and cautious conservation of unique and fragile features when a multiple use, agriculture, or recreation plan is implimented. Although these points may be offensive to some, they are strongly advocated here.

The third concern respecting the alternatives is related to the decision to establish fixed management units along the river. That is, the choice of management alternative does not alter the size or shape of the management units. A different map is not required for each alternative. Instead, it seemed more desirable to establish separate land use management schedules to fit each alternative. This is shown on Figure 17 - Alternatives For Land Use. This matrix reduces all land use decisions to a yes, no, or perhaps base and clearly displays the distinctions between alternatives. Again, some disagreements are expected concerning certain assignments but these can be either defended or resolved.

Public Involvement:

Although residents, groups and agencies have been aware of the Study and were contacted at various points along the course of doing the Study, everyone affected is not satisfied that ample provision for his involvement has been made. The decision to go to the public before any alternatives were developed is considered a positive move. The decision to go to the public again before an alternative is selected is also considered most desirable. Still, it is not assumed that the Study, the end product or even many of the recommendations put forward in it will be fully agreed to or accepted.

There still remains the very real concern that most of the shorelands along the Little Red are privately owned. To complicate planning for these lands, there is not unanimous agreement concerning what is the greater public good. Animosities toward certain people and uses are quite deep seated, but are often honestly rooted in past experiences which have fully justified their continuance. Still, the public participation process has been helpful in bringing the concerns of local residents to the attention of the planning staff, it has permitted the staff to clarify the scope and relevance of the Study, and established a measure of communication in several directions. These are all vital to planning and to management based on planning. At no time should the residents of this Study area or any other area be given cause to think their interests are not worthy of recognition.

The public participation process also provides a direct channel for communicating to local residents, the concerns, problems, or needs for new priorities. Without this link the man on the land may be poorly informed concerning the problems of water quality, habitat, domestic and industrial water supply, or numerous other stream and shoreland issues.

GLOSSARY OF TERMS

GLOSSARY OF TERMS

Hydrologic Cycle: A term which describes the recurring sequence of water movement as it evaporates from the ocean, land, and vegetation surfaces, condenses in the atmosphere as clouds, falls to earth as rain or snow, enters the groundwater, streams and lakes and progressively moves downslope toward the oceans where the cycle continues. This cycle may be short circuited in various places since evaporation may transfer water vapour into the atmosphere from the extensive snow surfaces by a process known as sublimation, from leaves of plants by a process called evapotranspiration, and directly from inland surface water.

Hydrograph: A graph used to illustrate the volume of water flowing past a specific point in the river channel through a period of time. The hydrograph may represent long term average monthly flow, mean daily flow, or simply a continuous record of flow during a stated period of time.

Riparian Rights: Those special privileges which are available to anyone who owns land having a natural watercourse running through or touching his land. These rights do not depend on actual use of the water or ownership of the bed, but are connected with the land. A riparian owner's right to the reasonable enjoyment of the stream includes the right to take water for all ordinary or domestic purposes and for so called extra-ordinary purposes connected with the riparian land and the dwelling situated thereon. These rights are qualified by the lawful and equivalent rights of other riparian owners along the watercourse. (L.U.F. Report No. 9)

Water Licence: Under the Alberta Water Resources Act, a water licence authorizes the person to whom it is granted, rights to use, impound or divert public water for specified purposes. Apart from the issuance of a water licence only riparian water rights are available.

White water: Where the flow conditions of a stream are strongly influenced by abrupt changes in channel gradient, obstructions in the bed of the stream or along its walls, abrupt changes in its width or abrupt bends in the channel then there will be a change from a streaming type of flow to shooting type flow. The term white water is used to describe this shooting flow, because of the prevelance of foaming air bubbles which are trapped in the water. White water is commonly referred to by specific terms such as falls, rapids, rollers, keepers, or rock gardens. It is most commonly understood by river paddlers and boaters. (Hooper)

Watershed: All land from which surface water flows into the same waterbody.

Viewshed: The extent of land which can be viewed from the river and from which some portion of the river may be seen. (Jones)

Riverscape: That area of land and water whereon activity or influences will produce a response in the functioning of the river and its dependent systems. This generally includes all of the viewshed and extensive portions of the watershed.

Streamway Influence Belt: An extended band of stream influence where various stream related phenomena occur. The condition of this land and its management has a direct influence on the character and functioning of the watercourse, and the presence of the watercourse has a direct influence on the character and use of this land. This area is identical in description to the riverscape but differs in application due to the unspecified lateral boundaries of the riverscape. The Streamway Influence Belt is defined to include the Streamway Corridor, the entire floodplain and a 100 meter wide shoreland fringe. Where the floodplain lacks distinction, or where a distinct valley-top break-in-slope exists, the S.I.B. extends to 1 km beyond the nearest wet channel or 100 meters beyond the break-in-slope, which ever is relevant.

Floodplain: That part of the river valley located immediately along side of the channel, and extending back from the channel, having a very gently sloping or flat surface. This surface is subject to flooding during periods when the water in the river rises and spills over its immediate banks. The accepted limits of the floodplain tends to be the maximum area inundated by a 100 year return flood.

Streamway Corridor: The stream-dependent corridor made up of one or more wet or dry channels and within which normal stormwater runoff peaks are contained. It also includes all shorelands whereon the flora, fauna, soil and topography are dependent on or influenced by the height and velocity of the fluctuating flows of the river arbitrarily established is being 10 meters back from the normal shoreline on both sides of the river.

Streamway: That part of the river system which includes the water in the river as well as its bed and its shorelands up to the bank-full level.

Channel Pattern: A term used to describe the configuration of a river if viewed from overhead. Four patterns are commonly recognized; these being fixed, braided, meandering and branched.

Fixed Pattern: is commonly found along a headwater segment of a river or where it is confined by geologic structure. It has a moderate to steep gradient.

Braided Pattern: is divided into several channels which successively meet and redivide. It has a moderate gradient and the channel islands which separate the channels are mainly composed of river gravels.

Meandering Pattern: is sinuous with a great degree of symmetry and a fairly low gradient. Within the broad meandering pattern two sub-patterns can be considered. The pool and riffle sub-pattern has a repetition of shallow steep riffles followed by deeper, quiet pools. The entrenched sub-pattern is cut deeply into bedrock, has a steeper gradient, a single channel and a course boulder bed. Both of these sub-patterns have the sinuous curvature known as meanders.

Branched or Anastamosing Pattern: two or more channels separated by stablized islands. Merging and redividing occurs. It also includes the distributing situation present at estuaries.

Segments of Experience: An expression used to express the assumption that human experiences in physical settings are greatly influenced by the conditions of the setting. The refinement with which the experiences can be predicted depends on the scale of the area considered. Each riverscape segment presents its own form and intensity of experience.

Classification Hierarchy: A sequence of segments and sub-segments identifiable along the length of the river. Within the larger, more loosely defined segments, are smaller and more clearly defined and more meaningful segments. At each scale these segments are defined on the basis of physical and visual characteristics. Each river segment offers particular or general types of experience, depending on the scale. These segments, in decreasing scale of experience are the Region, Sub-region, Reach, Run, and Unit.

Region: The total area included in the study of a river and its shorelands. It may be extended to include the total watershed or be restricted to the stream process corridor (Bauer) or the streamway influence belt. In this study, the riverscape was selected.

Subregion: That portion of the riverscape located between two major tribuatries, between a major tributary and the river's headwaters, or in a major tributary.

Reach: That portion of the riverscape extending from one minor tributary to another or to a major tributary. It has a common distinctive character or a sequence of distinctive segments called runs.

Run: A term used to describe segments of the riverscape having meaningful and identifiable characteristics and limits. A run consists of one or more distinctive units. The lateral boundaries may be confined to the limits of the floodplain, but need not be. In this study each run extends along the river from one roadway bridge to the next.

Unit: The recognized name for the distinctive river segments in which conditions are largely homogeneous and to which river experiences essentially relate. It is the minimum segment for which data are collected. Within a unit specific site differences will often occur.

Characteristic: A term used in this study when referring to a factor or feature which adds to the character of a site. These factors or features (characteristics) may be general or specific. In the inventory portion of the study generalized categories of characteristics are selected and within each category several specific characteristics are rated. These are all presented on Table D.

Magnitude of a Characteristic: An evaluative rating of the level of expression demonstrated by a feature. The rating may apply to the feature's quality, to its quantity, or to its significance in other ways. The magnitude value is a numerical statement of the significance of the characteristic to river experience.

Form of Expression: A term used to convey the significance of a characteristic. A knowledge of the magnitude of each form of expression makes possible a decision concerning the opportunities available at a particular location. Eleven forms of expression are presented.

Uniqueness: A quality which expresses the significance and distinctiveness of a characteristic.

Diversity: A quality which expresses the variety, complexity and evenness of characteristics.

Fragility: A quality which expresses the durability, resiliency and resistance to change, or ability to survive stress.

Seclusion: A quality which expresses the isolation, privacy and freedom from crowding or observation.

Seasonality: A quality which expresses changes of particular elements and processes and result in varieties of experience along a recurring schedule controlled by the seasons of the year.

Sensuality: A quality which expresses a capacity to produce satisfying or stimulating responses for an observer or user. Both the stimulation and the satisfaction derived are of an esthetic nature.

Paddleability: Relative to the watercourse, a quality which expresses a potential for recreational canoeing or kayaking.

Cultivability: A term used to express the capacity for soil tillage generally for commercial crop production.

Resource Capability: A statement of the potential of the natural resources to enhance the economy evidenced by the degree to which their characteristics are expressed.

Site Developability: An expression of the quality, durability, and supportive condition available to enhance high impact use.

Existing Development: An expression of the extent of human action which has occurred as is evident through modifications of the natural equilibrium.

Categories of Experience: A term which indicates the various broad groups of functions shorelands may serve. Within each category several specific but complimentary uses or management priorities may be identified. Experience is a term which is very closely related to use and function. The indicators used in this study are:

Preservation: That approach to resource management whereby the physical, cultural or esthetic characteristics of the area are retained in an unaltered state. Along shorelands preservation areas offer sanctuary for wildlife and allow observation of ecological processes.

Passive Recreation: That approach to resource management whereby very low intensity activities of a recreational nature are favoured and unique or fragile features are protected. Areas suitable for this designation may have appeal but they cannot tolerate heavy use. It usually relies on the natural characteristics of the site.

Active Recreation: That form of land use which concentrates a relatively high density of recreators onto a location or else accepts high impact recreational activities without causing excessive disfigurement to the area or unsatisfying experiences for the recreators. It usually implies a reliance on major equipment.

Agriculture: That form of economic pursuit whereby food producing pursuits are dominant. It generally involves tree removal, soil tillage and crop harvesting, and includes single or mixed operations involving livestock, poultry, forage, vegetable, and grain production. Agriculture is the traditional pursuit of the rural land owner.

Extensive Economic Activity: Those types of income generating pursuits which are land orientated, but which tend to be dispersed over a significant area. In non-agricultural areas it includes most forms of natural resource use or recovery such as livestock grazing, timber harvesting, and oil and gas development.

Intensive Site Development: A general term which includes major concentrations of development activity which significantly alter the natural character and function of an area and tend to be long term and high investment in nature.

Matrix: A graphic form of storing and displaying multiple elements of data in a format whereby the linkages between two or more of the interrelated components may be easily traced. It is an elaborate grid used for analyzing the value of indiviual characteristics as well as groups of characteristics in relation to small and large components of the system.

Percent of Mean: A term used to express the quantitative relationship between two or more values or scores using a scale which fixes the average (or mean) score at 100 percent. All scores which are greater than the mean will appear as an appropriate percentage above one hundred while scores which are below the mean will be less than one hundred percent.

Integrity: The quality whereby the elements and processes in an area function or relate together as parts of a complete total system. An area rich in integrity expresses itself as a harmonious and sound composite, unimpaired and free of destructive factors. (Jones)

Campground: An area of land where overnight accommodation is available for the placement of basic and/or mobile recreation shelters including recreational vehicles and tents. Four levels of refinement are generally recognized among campgrounds.

Primitive Campground: A land area designated for camping use but left in a primite (undeveloped) state. Motorized access is not generally available and tents are the usual form of shelter. Tables and privies are not available although firepits may be provided. No designated lots are identified so placement of tents is on a random basis. Primitive campgrounds are most commonly used by hikers, paddlers and other trail users.

Basic or Unserviced Campground: A land area developed for camping use and having designated lots for the placement of tents or recreational vehicles. Basic services include potable water, table, dry-pit privies and fire pits or fire boxes. Fire wood is usually available.

Semi-Serviced Campground: A land area developed for camping and having designated lots for the placement of tents and recreational vehicles, but at least 50% are supplied with individual electrical hook-ups and 25% have water hook-ups. These campgrounds are also provided with central service buildings equipped with wash basins and flush toilets and a sewage dumping station. Each lot has a table, a fireplace and access to a garbage receptacle. Firewood and tapwater are available.

Serviced Campground: A land area developed for camping and having at least 75% of the designated lots equipped with individual electrical service, 50% with water hook-ups and 25% with sewer. Central service buildings with flush toilets and wash basins are available to all other lots and a sewage dumping station is on the site. Each lot also has a table, firepit and access to a garbage receptacle. Firewood and tap water is available in convenient locations.

Cottage: A dwelling unit intended to be used on a seasonal basis and commonly located in an area of esthetic appeal where seclusion and recreation are available, usually in proximity to water.

Country Residence: A dwelling unit located in a rural area and occupied by persons whose income is not secured from agricultural activities. The minimum size for a parcel of land on which the dwelling unit exists is generally greater than 100 square meters (2500 square feet) although certain types and locations require a much larger minimum size.

Feedlot: Any holding facility where livestock are confined and fed. The term generally applies to beef stock kept for finishing to a marketable size and implies high density or large numbers of animals restricted from free foraging. The more technically accepted term for these operations is a livestock confinement facility. This name has sufficient latitude to include dairy operations, pig farms, and wintering enclosures for livestock.

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Appendix `A´

GENERALIZED POTENTIAL

APPENDIX A

GENERALIZED POTENTIAL

INTRODUCTION

Following from the inventory and evaluation a generalized use potential for each unit can be identified. This is done largely from a comparison of scores on the Percent of Mean Matrix. The paragraphs below discuss the units and group them according to the river run involved. This is only a generalized use potential because none of the four alternatives is used at this stage. The results are shown on Map 15. Each management alternative presents a specific bias that will alter the preference in a given direction. Those are dealt with in Appendix B.

A - RUN: COTTONWOOD

The entrenched lowermost reach of the Little Red Deer River is distinctly different from all of the upstream reaches. Along this six kilometer segment the channel is carved into the surrounding landscape to a depth of approximately 25 meters. This incision brings it to a level that conforms with the Red Deer River into which it flows. The meandering stream has imposed itself upon the looped-meander type of valley, leaving a distinct floodplain and remnants of valley-side terraces on either side. The channel gradient is somewhat steepened along this reach as a result of the stream's natural attempt to find a common level with its mother channel. The valley sides are steep and mostly tree shrouded although the larger flats have been cleared and are now in crops. Several cliff faces project above the shoreline where the stream continues to attack the outer slopes. With the features just described, this run possesses a strong natural character. The presence of and potential for beaver, muskrat, deer, waterfowl and grouse, adds a biological richness and variety which enhances its suitability for preservation and introduces a recreational appeal.

UNIT A-1:

The most significant attribute of this unit is its confluence situation which is a unique feature for each river. Because of this feature, and the biological conditions that are associated with it, particular care should be exercised to avoid initiating damages that will migrate upstream. Fishery habitat, particularly for migration purposes are significant. It is unfortunate that clearing of the terrace at the point of confluence has happened. A natural tree cover here would do much to preserve wild ungulate species such as deer, but certainly other species would be similarly benefited. The deep valley, with its forested sides offers excellent shelter for domestic livestock. However, the continued and excessive grazing of cows on these valley sides is destroying new growth and even damaging mature trees. Unless this situation is reversed, there will be progressive aging of the forest and eventually decadence and death will occur among the trees. Access, presently available by motorized vehicles from both sides of the valley is used mainly for access to fields, but no improved roads exist. In response to the diversity and uniqueness of this unit, it is rated high for passive recreation, active recreation and preservation.

UNIT A-2:

Apart from the confluence characteristics of the previous unit, this part of the valley has nearly identical features. Both have a variety of features that warrant preservation but also have a capacity for recreational uses. The valley in this unit yields the highest passive recreation value found for the entire river, while agriculture and development values are quite low. Again both uniqueness and diversity are the significant characteristics. Access is mainly available along

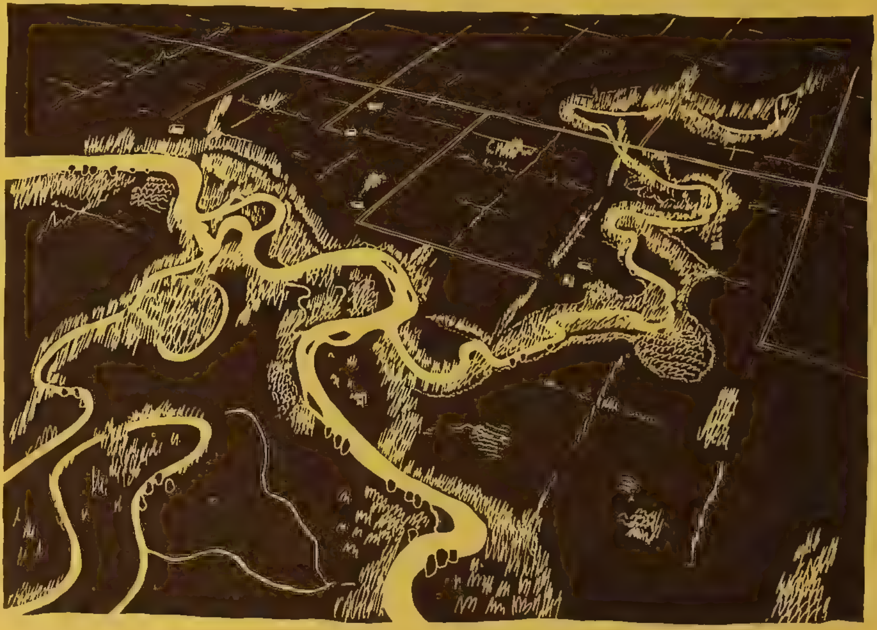

Figure 13 COTTONWOOD RUN

the Cottonwood Road and by trail to cultivated terraces. Although this segment has been somewhat altered from its natural condition, it continues to offer much of its original diversity. Lands along the valley sides and bottom are suitable for recreational use if carefully done and an excellent linear experience is possible for walking, cycling or ski touring along the entire river. In winter the ice covered stream provides a natural pathway for snowmobiles and during periods of moderate to high flow in the river, the paddler would enjoy quite a scenic and eventful trip downstream from the Cottonwood Road.

Summary of A - RUN:

In summary, A-Run possesses qualities of diversity, uniqueness, seasonality and paddleability. It is accessible, in close proximity to Innisfail and Red Deer and could provide a much needed destination for campers. The cultivated lands in the valley bottom should eventually be shifted back to natural vegetation to enhance a recreational function throughout. With wisdom, a very appealing facility for outdoor recreation could be developed here, although the main concentration for developed facilities should be in Unit A-2. Moderate to fairly intensive levels of use could be accommodated in the valley although linear experiences should be given high priority. Conservation efforts should be initiated promptly and the effects of excessive clearing, cultivation, grazing and other encroachments corrected.

B - RUN: BOWDEN CREEK

This run forms a connecting link between two superior natural and esthetic areas. Three distinct units can be identified within this run, all of them characterized by the looping meander pattern with subdued banks, broad floodway and a pastoral landscape. A gradual deepening of the valley occurs between the upstream and downstream ends of this run resulting in a change from a very slight valley, with poorly defined valley breaks to a broad, deep valley with distinct valley breaks at the Cottonwood road. Through this distance the valley is characterized by a pattern of abandoned channels, terraces and oxbow lakes. In places the valley exceeds a total width of 1.5 km (1 mile). As a result of the continued working and sorting by the migrating streamway, the valley floor is made up of coarse materials which are well drained and underly a mantle of Regosol soil. Access into the valley and to the shoreline is not plentiful, although all owners of adjacent land have access as needed. County roads of good quality cross the valley at both ends of this run. Much of the valley bottom is either cultivated or grazed by livestock. Beyond the valley top break, nearly all of the surrounding upland is broken and in crops.

UNIT B-1:

This looping segment approximately 6 kilometers in length, flows in a clearly defined channel and marks the transition from a migrating meander belt to an incised valley. Part of the old floodplain, now abandoned by the river contains a pair of partially fossilized channels which are best described as horseshoe bogs. From the south side of the river Bowden Creek enters the unit. This is an intermittent stream made somewhat despicable because it is the outflow channel for the Bowden and Bowden Institute sewage systems. Although releases of the sewage is seasonal and timed to coincide with high flow events, there is no question but that contamination of the receiving waters occurs. A further source of contamination is a large-scale feedlot located directly beyond the break of slope along the old meander loop south of the river. Even with extensive effluent control measures and conscientious care, for which this and other operators must be credited, stream contamination from this operation can hardly be avoided since it is so close to the waterway.

The inventory for this unit is very similar to the previous one, with uniqueness and diversity rating high, but here, a higher fragility score is given. More existing development is shown because of the feedlot, a pump irrigation project and a pipeline crossing in addition to the extensive cultivation of valley bottom lands. In one location a cleared flat has been used as a community ball diamond. One known ford across the stream exists. The highest percent of mean score in this unit is for passive recreation in the valley, while continued agriculture appears to be the best choice for the uplands.

UNIT B-2:

In some respects this unit lacks distinction but this is largely because the main valley incision is no longer so evident here. The migrating meanders have generated a wide, shallow valley with various terraces, most of which are now farmed. One small oxbow lake remains. No tributary channels enter this unit and only one farmstead occupies the uplands within 1 km of the channel. Overall soil conditions are moderately stable and are receptive to cultivation. Agriculture rates highly in both the valley and on the uplands although passive recreation values in the valley are significant. Livestock grazing and watering present concerns to the vegetation and wildlife communities along the river and also to the water quality.

UNIT B-3

This very short unit possesses natural diversity in the forms of a channel island, a steep cutbank, old channel scars, distinct meanders and vegetative contrast. Good access is available by county road and considerable alteration to the natural cover has taken place as a result of farming and gravel mining. Still, a large, natural aspen stand remains in a low-lying but pleasant setting within a stabilized meander loop. It is not really surprising therefore, that passive recreation again rates highly in this unit, although extensive economic activity, including agriculture, is appropriate along the uplands beyond the valley proper.

Summary of B - RUN:

From the tabulated data above, it seems that agriculture should be given first preference along this part of the river. This would imply that the shorelands should not be acquired or developed for recreational facilities or for other non-agricultural functions. Where localized sites have potential for such functions, they must be considered subject to the agricultural interests throughout the run. The diversity of channel features, streamside vegetation and the thriving populations of shoreland or water dependent animals and waterfowl demonstrate a need to consider some measures for preservation adjacent to the streamway itself. This is further emphasized by the valley ratings for preservation and passive recreation. Therefore, the most important program for implimentation in this run will be the establishing of a Streamway Corridor and Streamway Influence Belt. Also, a shoreland trail system should be developed through this run to link the Cottonwood Run with the Spring Creek Run as far upstream as Red Lodge Provincial Park. Abatement measures should be undertaken to lessen the problem of contamination of the waterway from Bowden Creek and livestock confinement operations.

C - RUN: SPRING CREEK

In crossing six kilometers of landscape the river flows along 14 kilometers of channel in this run. It meanders sharply in places and along other parts it swings around large loops. As a result of the meandering pattern through here, there is evidence of channel migration in the form of old channel scars (fossil channels) and oxbow lakes. To the east, and in part, to the west of this run, a rather extensive area of sand hills and somewhat rolling terrain prevails. These are believed to be the products of periglacial delta deposits formed from an old river as it flowed out from the retreating continental ice mass. Two small tributary channels enter along this run, Spring Creek enters in Unit C-2, and the point of demarkation between Units C-3 and C-4 is the mouth of Olds Creek. The lower, western and upper segments are surrounded by cleared agricultural lands while the eastern areas are still in a largely natural tree covered condition. Streamflow throughout is quite sluggish, a characteristic of the meandering pattern, but during snowmelt runoff, a major flow event exists. The entire run can be canoed during these major flow events. Periodically, flows are high enough to cause flooding over the natural levees.

UNIT C - 1:

To the extent that natural conditions favour it, the shorelands along these looping meanders are cleared and cultivated. Good access is available by way of a hard surface county road which bridges the river at the north end of the unit. Additional private access exists to farmsteads and fields along both sides of the river. The two farmsteads which are present occupy sites in close proximity to the channel and some of the cleared land extends to the valley bank. As a result of the present activity and also the relatively low scenic or esthetic responses provided from this unit, shoreland agricultural pursuits are favoured for the future. As elsewhere on the river however, it is essential to establish a conservation corridor to restore and protect the streamway as a public resource. A connecting trail link is also suggested along this part of the valley. This unit does not rate highly for any component of the inventory but scores high for agriculture on the evaluation.

UNIT C - 2:

Apart from the seasonal use cottage subdivision at Silver Lagoon, this unit can be considered nearly pristine. One old gravel pit and a small amount of cleared land for improved grazing are the only encroachments on the pristine character of the unit. On the west side, the most dominant features are the two oxbow lakes (lagoons). The northern one has attracted a thirty-three lot seasonal use cottage subdivision, but the southern one remains in a natural condition, serving as excellent habitat for deer, beaver and waterfowl and therein offering opportunities for nature study. All remaining shorelands on the west side of the river are still overgrown with a mixed spruce - pine - aspen forest. Some of these sites have excellent features for public camping, particularly the narrow peninsula bound by the sharp meander in the river. Here also, the large, shallow gravel beach is an attraction for youngsters. East of the river, the shorelands are quite inaccessible at this time, but offer exceptional amenities for outdoor recreation. The natural mixed-wood forest located above the floodway and the stable soil conditions appeal to various forms of recreational users. Camping, cottaging or country residential development would each find suitable conditions as would institutional camps. The floodway is not an appropriate location for development. This unit rates highly for uniqueness and diversity and demonstrates a particularly favourable location for passive forms of recreation. The Silver Lagoon subdivision is considered an inappropriate use of the shoreland in this location, since it disregards the natural processes and functions of the floodway and impinges on the normal geo-hydraulic processes associated with the streamway.

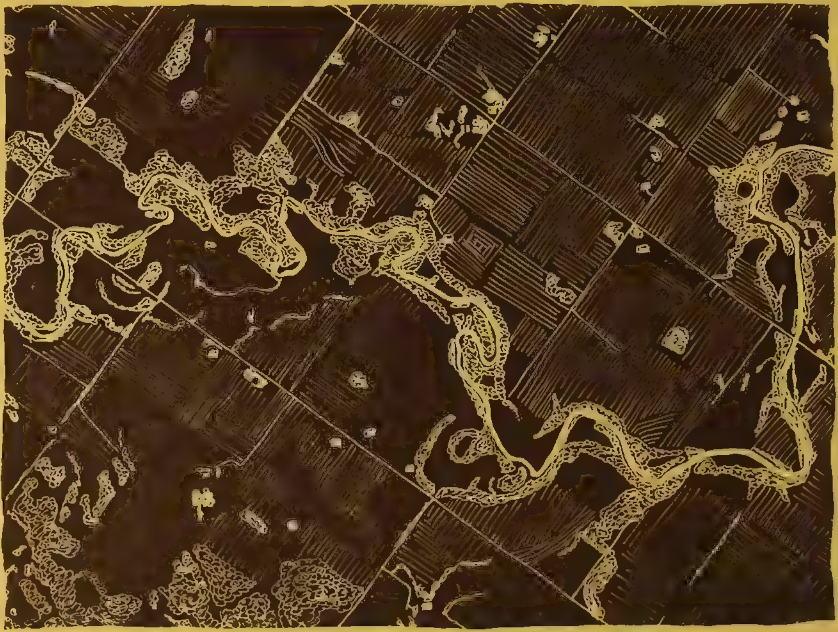

Figure 14 BOWDEN CREEK RUN

UNIT C - 3:

The meandering pattern becomes more complex in this part of the floodway. Streamside conditions through here lack much of the scenic attraction present in either an upstream or downstream direction. However, the vegetated flats contained within the meander loops and alongside the banks of the straighter reaches offer excellent habitat for furbearing game such as beaver, muskrat and mink. Deer too, are prevalent especially east of the river. Although the river is fairly sluggish through this unit, there are points of attack where erosion is occurring forcing the continued down-valley progression of the meander belt. Each point bar offers a beach feature and sometimes a slight riffle in the channel. Olds Creek adds local diversity, but this benefit is more than offset by the effluent carried in the creek from the lagoons at the town of Olds. A small, but poorly located livestock feeding operation occupies a streambank location along the west shoreline. The inventory demonstrates a high diversity value and a moderate uniqueness rating, together with a relatively high fragility. From these, the evaluation defines passive recreation and preservation as the preferred management orientation. The importance of a conservation corridor along the streamway is again evident and the need for caution in using the sand dunes on the eastern backshore is stressed.

UNIT C - 4:

This unit supplies an important link in the regional public recreation facility system. Red Lodge Provincial Park is developed east of the river on the spruce forest shorelands along a major reversing loop in the river. Although the channel itself lacks distinction through this unit the valley flats with their adequate drainage and sufficient supply of moisture enhance the growth of the healthy forest. Since the park location has been protected for several generations, the spruce have reached unprecedented sizes, evidence of what could exist along many similar shoreland locations if encroachment and clearing were not allowed. Beyond the park and extending north to Olds Creek, the dominant vegetation shifts to aspen, but the shoreland amenities are still superior for recreation pursuits. Useable beaches occur on most point bars thereby offering water contact recreation opportunities. Sites of recent clearing demonstrate a continued disregard for shoreland amenities. Again this unit scores highly for diversity and uniqueness, seasonal differences and paddleability. The present analysis suggests an active recreation priority.

Summary of C-Run:

This run should possibly be recognized as the single most suitable location for recreation activities and facilities along the entire river. Several distinctive features and much variety are present and existing access is well developed. The presence of the Park and the Silver Lagoon subdivision provide initial impetus to a continued recreation orientation. However, definite caution is urged concerning development of the sand dunes and the tree covered uplands east of the river. The largely natural conditions present here are a credit to the past and present owner's sense of environmental awareness even though natural soil conditions do not favour intensive agricultural pursuits.

D - RUN: TRAIL CREEK

D - Run is only one unit, a very distinct segment of the river. In traversing 4 kilometers the channel meanders along a course that exceeds 6 kilometers. Much of the immediate shoreland is in a natural state, having variations of aspen, white spruce and low shrub vegetation thriving on the banks. Throughout the unit, ideal habitat exists for beaver, waterfowl and deer. Other species are also prevalent. Both the valley conditions and the surrounding shorelands have been subject to periglacial outwash and streamflow as the Red Deer River during that era was diverted south-east across this area. Several depressional areas with organic soil and poor drainage mark the course of these old channels. Across the gravel plain left by that event, the Little Red Deer River developed its course and it too shifted considerably in its attempt to cut and fill the valley and establish a comfortable route. In response to both of these events, present day gravel operations are active in the old floodways. In one instance too, the river has bifurcated and rejoined resulting in a large isolated island. Trail Creek, which enters from the south drains only a very small watershed and therefore only carries water during snowmelt or when rainfall is sufficient to generate overland flow. Since it flows out of productive cropland, it may carry some chemicals supplied to the soil by fertilizers, insecticides and pesticides. However, no monitoring has been done to confirm this. The diversity of this run is represented in the inventory matrix. Fragility, uniqueness and seasonality also rate quite high. In the analysis, the passive recreation value is highest while active recreation and preservation are quite close. There is a definite potential for outdoor recreation facility development at several sites and in particular where a mature stand of spruce or mixed wood occupy well drained areas adjacent to point bars which have beach potential. At the present time, this is all private land, so much development would have to be privately pursued. However, the Streamway

Corridor must be introduced through this unit to avoid the progressive encroachment of clearing and cultivation. The oxbow lagoon north of the river provides excellent waterfowl breeding spots. Due to its isolation from the mainstream and its largely cleared shoreline, this lagoon could serve as an offstream watering hole for livestock and thereby protect the streambank from trampling and the associated effluent contributions. In the truest sense, however, this lagoon is a part of the floodway for the river and is deserving of ecological conservation. A process of reclamation needs to be started in the gravel workings to remove their blight condition. Back from the floodway agricultural practices are most appropriate.

E - RUN: GARRINGTON EAST

Along this run the Little Red flows at the bottom of a well defined but relatively shallow valley. Pastoral conditions prevail and a distinct meander sequence is evident. A broad, flat floodplain extends along the valley bottom, alternating from side to side in sequence with the meanders. Where drainage is good and soils are deep on these flats, the trees have been cleared to the immediate edge of the channel and crops are grown. Clearing is still being done as farmers seek to increase their productive acreage. Streamflow is not swift or high generally but occasional over-bank flow occurs and damaging erosion has been registered. Just downstream of the Seventh Day Adventists camp, the stream splits around a large low lying island but the two sides rejoin just downstream.

UNIT E - 1:

Through this unit the river swings away from the main valley wall during low flow, but at high flow forms two channels and a large island. Although the island is partially cleared and is used by livestock, these are not appropriate land use choices. The natural conditions would be ideal for native wildlife habitat or even for extensive forms of recreation associated with the church camp on the valley top. The treed loop at the downstream end offers some potential for a small scale camping or picnic area. The Seventh Day Adventist camp is quite appropriately developed. Some of the buildings are too close to the valley break, but, overall, the development, its uses and even its sewage handling are not presenting problems. Any expansion into the valley should be restricted to low impact non-facility type functions. Across the valley to the north, a feedlot occupies a spot excessively close to the streamway. Although this operation seems to conform with the Code of Practice, it is not in the interest of the best stream management concerns to locate such a facility so close to the stream. Effluent runoff cannot be properly contained and so stream contamination results. Relative to other valley ratings, this unit does not score highly for preservation and recreation. Agriculture and development are high. To some extent, those scores are affected by the camp and the feedlot already there, as well as the existing cleared condition of the valley floor. In its natural state or if allowed to recover, the ratings would possibly be different. However, cultivated cropland is considered an appropriate land use choice on valley flats lacking high ratings for diversity or fragility and uniqueness, pr provided that the Streamway Corridor is not compromised.

UNIT E - 2:

The distinction about this unit exists in its steep, high right valley wall and pastoral valley floor. Surprisingly, the meander sequence of the channel has progressed to the place where it is exactly opposite to the meaner sequence of the valley. Essentially all of the flats are cleared of trees to the stream levees and all are cultivated. One farmstead is situated on the low terrace, just above the point of attack by the stream. Agriculture scores very high for this unit. However, if the Streamway Corridor can be established, a trail system would be feasible through here. In the absence of a treed streambank, an appropriate trail link could be shifted to the high and heavily vegetated right valley wall.

UNIT E - 3:

This short unit (2 kilometers) is the site of a major elbow in the regular sequence of river meanders. Its uniqueness relates to the presence here of an old periglacial river channel which meets the Little Red at right angles and has left an organic and gravel situation which extends west from the channel along the old river valley. The Little Red has established its own distinct channel with well defined point bars and cutbanks within this situation. The

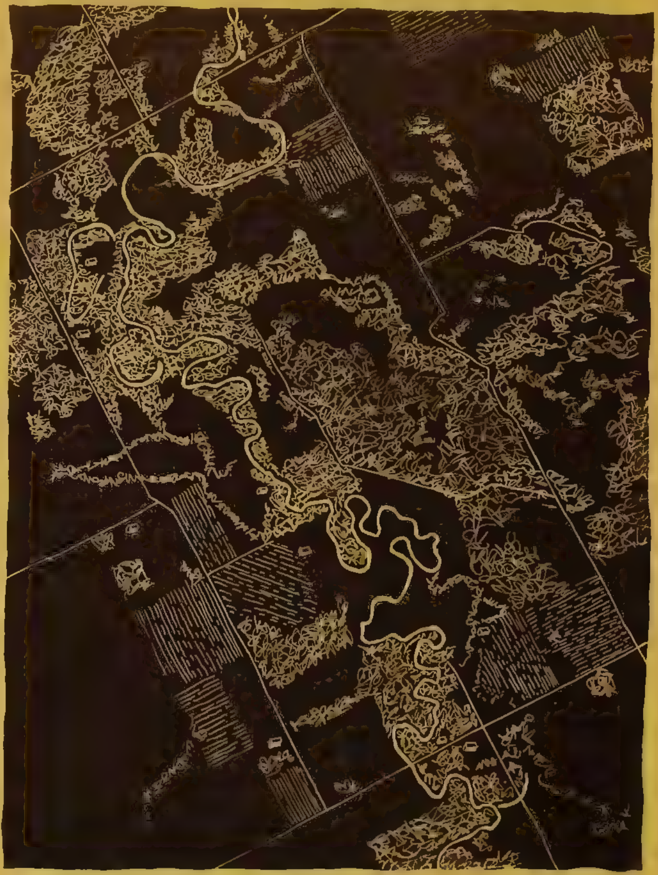

Figure 15 SPRING CREEK RUN

entire valley here is still in a natural condition, largely because soil conditions are not favourable for cultivation. From the right valley break, where the stream at one time was active, to its present location against the east valley wall, the floodplain is over 1 kilometer wide. This rather extensive area, underlain by gravels and consisting of poorer quality regosol soils, and containing a low density aspen and shrub vegetative cover, occupies a full quarter section. According to the inventory, this unit is neither unique or outstanding for any purpose and its highest rating is for extensive economic uses, which includes livestock grazing and gravel mining. It also has definite potential for a link in the trail system along the river.

UNIT E - 4:

From some points of view this part of the shoreland has been abused. Gravel is excavated from the floodplain, recent clearing continues adjacent to the river bank and a farmstead and road occupy part of the floodplain where erosion is actively progressing. However, the gravel pit is not badly operated, except there is a need to initiate a planned program of reclamation. The other activities are not uncommon to the valley. Extensive economic activity is appropriate along this part of the valley, but the Streamway Corridor needs to be implimented here and the endangered roadway either moved or the channel bank armoured to prevent further erosion.

F - RUN: MOUND

This 2 kilometer run comprised of two units, although essentially pastoral in character, presents some surprisingly pristine conditions. Streamside vegetation is intact along much of the river and large woodlots remain at several locations. The valley breaks lose their distinctiveness along this run as the valley depth decreases, but evidence of old outwash or ice-melt runoff conditions still prevail. Activities and installations associated with the recovery of oil and natural gas begin to show up in this run also.

UNIT F - 1:

There is a certain amount of diversity in this unit. It is provided by the well defined channel, treed banks and meander pattern. Diversity is also demonstrated by the development along the river. Cleared, cultivated croplands, feeding operations and gas wells occur. Roadways are interrupted by the river so access is partially restricted. However, the location of farmsteads and other developed facilities reinforce the feeling that rivers attract development by the same virtues for which they attract conservation. Extensive economic pursuits are preferred along this unit although a Streamway Corridor must be implimented.

UNIT F - 2:

In almost every respect, this unit repeats the characteristics present in Unit F-1. Glacial-alluvial materials prevail, resulting in a rolling-type landscape composed of coarse parent materials, overlain by black chernozem soils. Both present and old channel side slopes are too steep for cultivation and so remain vegetated. Where shorelands are relatively level though, they are cleared even to the stream bank. Access and development for oil and gas production, one livestock breeder, two abandoned gravel pits, grazing and cultivation dominate the unit. Diversity again scores highest, while uniqueness and fragility are quite low. The streamway is stable and regular and could provide some recreational benefits, particularly if the fishery could be upgraded. As a consequence of present development levels, the evaluation focusses on agricultural operations as most suited to this unit. Had clearing been less thorough here and along much of the river, it is probable that a better fishery would exist at present. With the implimentation of a Streamway Corridor, the fishery and wildlife habitat will improve and superior conditions will be available for public trail linkages. Improved access is not encouraged at this time.

G - RUN: DOGPOUND CREEK

This 7 kilometer run possesses two very dissimilar units. Although the upper unit bears a certain resemblance to A - Run, in relation to its well defined and pastoral floodplain, the difference lies in this unit's less well defined valley and a deficiency of valley side foliage. The lower unit is largely conditioned by the past glacial river deposits into which the Little Red has established a shallow channel. Beyond the river valley cultivated cropland blankets the landscape. Throughout this run, the integrity of the landscape has been badly altered although stream damages seem to be minimal. With favourable flow conditions, a trip by canoe through this run would be quite enjoyable.

UNIT G - 1:

Through this unit there is a need for immediate establishment of a conservation corridor to protect the unique physiographic and biologic association that exists. The past and present activity and development north of the river demonstrates a definite lack of concern for nature's processes or even her features. Certainly, this is not the highest quality amenity site along the river, but there is a natural ecosystem here developed from the river processes, and this provides an excellent habitat for deer, and elk, as well as beaver, grouse and waterfowl. Blue herons are the most exotic species of wildlife along the river, and this is the unit where they have been nesting. The confluence of Dogpound Creek with the Little Red adds volume and diversity to the main stream, and although the Dogpound is small, contributing a small volume of water to the Little Red, there is a significant decrease in flow above this point. Old channel patterns are evident, one on the north side of the river around which the road is diverted, and another south of the river forms a hook shaped oxbow lagoon. Because of the level of present activity in this unit, the evaluation presents intensive development as first priority. This evaluation implies continued gravel mining is acceptable. Although gravel mining is devastating to the landscape generally, the gravel is much needed and is only extractable from places where it occurs. Still care needs to be exercised to avoid opening excessively large scars, reclaiming must proceed quickly and excavations must be kept back from the areas where either inundation or siltation will result.

UNIT G - 2:

Along this pastoral valley, the river is little affected by the adjacent shoreland uses except as agricultural chemicals, livestock wastes and sheet erosion contaminate the water and tree removal on the banks deprives the water of shade, thereby allowing the temperature to rise undesireably. No developed facilities clutter or irritate the banks. The streamway is well defined, systematically meandering and has well established point bars and cutbanks. The most essential management concern suggested here is simply for the application of a Streamway Corridor. As part of this conservation corridor, hiking, ski-touring and seasonal paddling are appropriate. One of the point bars is satisfactorily endowed to contain a basic campsite for the benefit of the non-motorized trail user.

H - RUN: WESTWARD HO

This run (approximately 9 km) has a fairly unique and diverse combination of natural and esthetic resources. Through most of its length, this run presents an enclosed landscape with the immediate river itself providing a significant part of the strong canyon character. The banks which are well forested on both sides and steep on the right bank, make this run an outstanding esthetic resource which compliments linear recreation activities such as trails, canoe runs and possibly a recreation node to take advantage of excellent camping, picnicking and even fishing opporunities. The valley bottom and south valley side provide the greater extent of the esthetic appeal in this run, while the north part of the upland and to some extent, the valley bottom offer agricultural opportunities. There is nowhere else along the Little Red Deer River however, where it is so evident that economic productivity in the short run has taken precedence over the conservation of high quality, intangible values. An appropriate approach to regulating the entire entrenched part of this run would have emphasized the importance of vegetation, seclusion, running water, topography and the socio-recreative benefits they provide.

UNIT H - 1:

This unit, though partially misused and fairly fragile, offers an excellent river experience. It could well be the key to the most important recreation area along the Little Red. The unit has excellent natural and esthetic characteristics as well as superior values for uniqueness, diversity and fragility (the inventory is conspicuously conservative for this unit). Some of the characteristics of particular note are the spectacular valley wall, with its fragile and highly erodable exposed clays, a mixed stand of mature trees, large and accessible valley flats, and a segment of channel having characteristics of the babbling brook and the navigable river. It is interrupted by various cobble ledges or boulders and beaver activity is evident. The Nazarene Church youth camp is the only development in the valley part of this unit, but this camp occupies all but a small part of the right bank.[25] For its purposes, this facility has a most ideal location, experiencing isolation, accessibility and a high quality natural setting. However, some cosmetic type treatment is needed on the site and sewage handling requires monitoring because of the numbers of users and the proximity of this whole operation to the water's edge. A large river flat on the left side of the channel has regretably been put into crops. In spite of

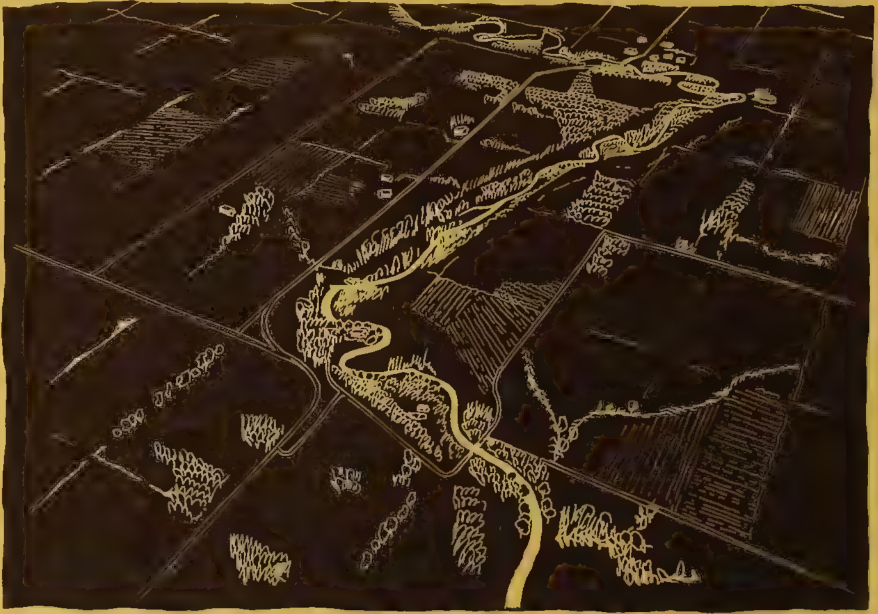

Figure 16 WESTWARD HO RUN

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[25] See cover photo.

this, a well defined and unconfined Streamway Corridor needs to be established through this unit, in part to restore the immediate integrity of the shoreline and protect it for the natural biologic and geohydraulic functions it performs. These flats on the left side of the valley have a potential for development of a truly fine public camping area, but a re-established tree cover is essential for this. These flats also serve as fertile crop producing fields but this hardly seems the highest priority on this location. Above the valley, Highway 27 bends to bypass the valley. Along this area and on both sides of the river productive croplands dominate the uplands. One country residence has been recently built adjacent to a tributary gully and looking out to the scenic view of mountains in the distant west. Active recreation rates highest in this unit.

UNIT H - 2:

This unit, though very fragile and somewhat abused, offers a river experience that is unequalled elsewhere on the Little Red. It displays a high magnitude and concentration of natural and esthetic river characteristics as well as high values for uniqueness, diversity, fragility, seclusion, seasonality and paddleability. Some of the characteristics of particular note are the canyon, the steep-high valley walls, the unaltered tree stand, lack of present exploitation, isolation and the diversity of the stream itself. The stream is paddleable during peak flows, has interesting riffles, rock obstacles, including ledges, but few sites which could be called beaches. This unit, together with the next units upstream and downstream, presents an opportunity to create a superb public recreation complex for camping, picnicking, trail links and an ecological interpretive program as well. Through sensitive design and rigorous management and programming, this unit can provide for many users. A pedestrian bridge over the river could also help to tie the two sides of the system together. The presence of and interest in various wildlife species also needs recognition. Portions of this unit should be accessible to walk-in users only. Above the valley top, a considerable potential exists south of the river for a favourable mix of serviced camping, cottageing and some amount of country residential development. North of the canyon, agricultural uses should continue, but the restrictions required by a Streamway Influence Belt should be introduced.

UNIT H - 3:

Although this unit is part of H - Run, the physical characteristics of unit H - 3 lack significant similarities to the remainder of the Run. Here again, the broad valley, meandering channel configuration exists and agricultural forms of land use are dominant. The hamlet of Westward Ho presents the first, and only valley side urban form that exists on the Little Red Deer River. Some shoreland tree cover remains and several sites still retain their capacity to shelter wildlife and provide relief from the rather bleak clearings. None of the esthetic characteristics rate very highly. Although the hamlet may grow, all of the growth should be directed west and north, rather than towards the river. Between the hamlet and the river, the gently sloping, well treed lands should be kept for public use and retained in a largely natural state. East of the river and north of Highway 27, the primary function would also be recreational, although agricultural uses are appropriate to the extent that they are compatible. A Streamway Influence Belt and trail linkages are both essential in this unit.

I - RUN: HARMATTAN:

This run (18 kilometers of channel) crosses 9.5 kilometers of essentially agricultural land. The meandering river flows along at the bottom of a broad, but well expressed pastoral valley having few distinctive attributes. The only cross valley access is at the two ends of the run, although local access obviously exists to all cultivated fields and to the producing gas wells. Throughout this run, it is very evident that a Streamway Corridor must be adopted since the requirements of the river are not the criteria considered in past shoreland management decisions; rather, the interests of the land owner alone seem to have been considered, and the river was regarded as an obstacle to use or movement. In response to a review of this run one concludes that operators of land clearly demonstrate their freedom to impose single-purpose economic objectives onto a multipurpose natural system. If it were not for wetlands, steep slopes and rocks, there would probably be very few natural stands of trees retained in many agricultural regions.

UNIT I - 1:

There remains a considerable amount of diversity in this unit. The Westward Ho campground is a fairly good example of appropriate development on partially cleared river bottom lands. On the opposite side of the river the natural tree cover offers a pleasing cross river view for campers and a sandy point bar along the left bank provides fairly good bathing opportunities. Unfortunately, a lack of planning is evident in the campground layout and so, privacy and esthetic surroundings are also deficient. All remaining tree cover east of the river should be retained for visual benefits but also in the more swampy locations as habitat. Agricultural uses beyond the Streamway Influence Belt is most acceptable, but it needs restrictions near the river.

UNIT I - 2:

Probably no unit along the entire Little Red Deer River so clearly demonstrates an appropriateness for continued agricultural use, as does this one. In a comparable sense, there is probably no unit along this river that so clearly illustrates the sterilizing impact of an intensive approach to agriculture along shorelines During the history of settlement along the river here, nearly every tree, shrub and bush has been removed. As a result much of the filtering benefit supplied by trees, the stabilization provided by their roots and the shade offered by their overreaching branches, is lost. The stream suffers therefore from excess warming from the sun, sediments contributed through bank erosion and chemical pollution fed in from agricultural chemicals. A natural ecological shoreline needs to be restored and the constraints of a Streamway Corridor implimented. Livestock watering and trampling would therefore also be curtailed and so too the bulk of both solid and liquid animal wastes entering the watercourse directly would be prevented. Because of the somewhat straighter channel here, fewer pools and riffles are evident and fewer point bars or shallows exist. As a result, the waterway can be floated more readily than along most runs, even though the shorelands lack scenic appeal. Along this run, it is the uplands, particularly on the east side where superior vistas exist. The view of the mountains on the distant horizon is very appealing.

UNIT I - 3:

The contrast between the left and right banks in this unit are highly pronounced. The moderately sloping, completely cleared west bank is totally opposite from the steeply sloping heavily treed and unoccupied east bank. With the establishment of a Streamway Influence Belt, the needs of the unit will be quite adequately met. Continued agricultural useage of the west side is appropriate and the needs for habitat maintenance and extensive recreation, particularly walking and nature study, can be met east of the river.

UNIT I - 4:

A significant loss to the Streamway integrity is evident in this unit. Clearing for agriculture, clearing for pipelines and a power line, pipeline and gas well installations, and two farmsteads all impinge on the streamway environment. Five old fossil channels are very evident in the valley, each one serving us an uncultivable bog. The steeper east bank shows evidence of valley-side erosion but this is no longer active. One tributary gully enters the unit from the west, it contributing very little streamflow to the river. There are definite habitat conditions present alongside the river here, but these lack the importance of those farther downstream, since more tree cover is available throughout this part of the watershed. Parts of the unit, and certainly the variations between trees, waterway, clearings, pipeline corridors and open fields generally could provide favourable opportunities for a snowmobile camp and trail system. Again, the feedlot positioned on the bank of the looping fossil channel is viewed as prone to contaminate the water. Careful containment of effluents will be required if this is to be prevented. Throughout the unit, livestock watering should be restricted by means of fencing, so that access is available only at confined locations where river gravels provide adquate bank stability.

J - RUN: ELKTON:

In this run the channel length is 9 kilometers and flows along a meandering course through a broad, moderately sloping valley. Numerous old fossil channels are evident, some are abandoned loops of the Little Red and others are old glacial spillways. Several gullies lead down the valley walls, these forming the skeleton of local drainage ways. The intense meander pattern of the streamway itself is superimposed upon the larger meander belt of the valley, this being very evident in this run. As a result of the fluvial processes that have been responsible for the local landscape type, conditions are less favorable for agriculture here than further downstream or to the east. Poorly drained sites, gullies, excessive slopes and fragmentation of parcels by physiographic irregularities have resulted in an inconsistent clearing pattern. Most agricultural crops are used for livestock feed, either grazed directly or harvested for hay and feed grains. Along this entire run, livestock graze the available forage on the river flats and water in the river. Several farmsteads have been developed on the floodplain. Additional clearing is still being done to increase the acreage available for crop production. The presence of the oil and gas industry is more evident along this run than anywhere else along the river. A large gas processing plan operated by Canadian Superior Petroleum and the offstream reservoir used to supply Shell's wells with injection water best illustrate this. Numerous wells appear in this unit and the network of pipelines needed to deliver the gas to the plant criss-cross the valley. The extent to which these developments have been pursued with disregard for the stream and consequent damages is not known. Some of the survey information shows oily patches in the water and other discolorations. A bulkhead across the river to raise the water level at the Shell pumping site is effective but lacks respect for the movements of fish. Certainly,the number of stream crossings by pipelines is surprisingly high. Had the river been larger it seems certain that more attention would have been paid to combining several pipes into one crossing or else bringing the production from several wells into one line before crossing the river.

The inventory documents the low values for uniqueness, fragility, seclusion and only a moderate rating for diversity. But the extremely low sensual appeal offered is the primary reason for very low evaluation values for preservation and either passive or active recreation. Future

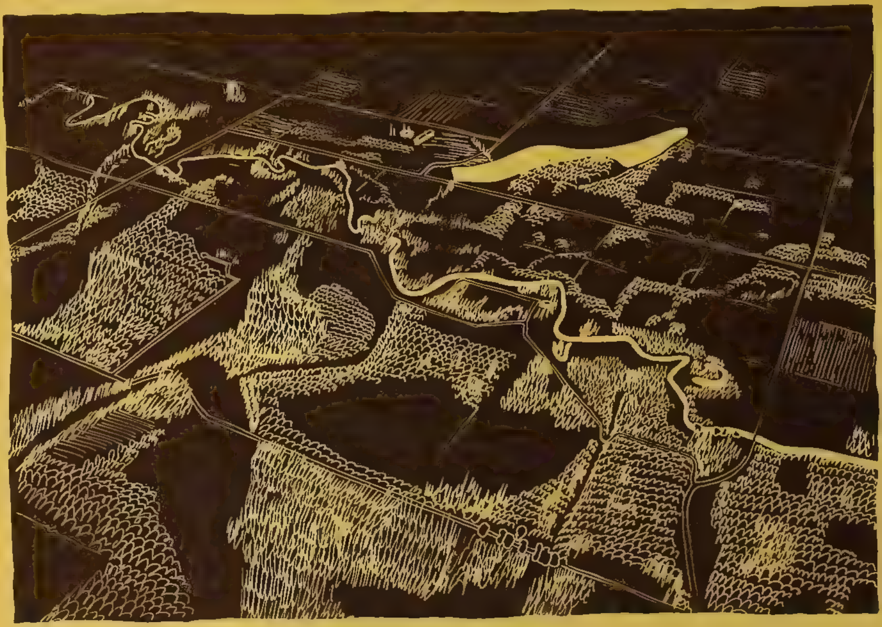

Figure 17 ELKTON RUN

uses should continue to center around agriculture and natural gas production but a strong plea is presented here for a Streamway Corridor and enforcement of its requirements so that further impositions on the stream will be prevented and correction of past excesses will be initiated. Although access by vehicle is possible to each well site and pumping station, these are private roads which deny public access. This being the case, only local property owners are aware of the impacts of activity in the area. These people, who are constantly exposed to a deteriorating landscape are somewhat less conscious of its magnitude. There is still a considerable potential for wildlife and a trail system for hiking, skiing and snowmobiling is worthy of consideration.

K - RUN: CREMONA:

Between Elkton and the Cremona bridge the Little Red continues its meandering course through approximately 18 kilometers. The gradient is quite gentle throughout so the flow lacks turbulence and, except for snowmelt or heavy rain events, would be unnavigable. Still the valley is broad and fairly deep, not entirely the product of this river's action. The streamway of the Little Red is superimposed into the valley and seldom tops it natural levees. Old spillway channels formed by glacial meltwater are clearly visible beyond the valley and remnant organic areas reflect the former drainage ways. The intensity of the oil and gas industry falls off dramatically along this run but agricultural activities continue to occur on virtually all cultivable lands. Many irregularities in the topography and numerous shoreland woodlots present a considerable attraction for recreation oriented uses. This run has been divided up into five shorter units largely according to these topographic and vegetational differences.

UNIT K - 1:

In this unit, the river labours its course across two sections of farmland. Due to its tightly meandering course the length of channel is over six kilometers in length. Much of the streamway corridor remains natural although the natural conditions do not present highly esthetic values. The amount of local diversity is significant however, and is accounted for in the numerous point bars, acutely bending channel, variable tree types and occasional mature spruce. Where tree cover is mature and quite extensive, recreational camping could be developed, but otherwise the shorelands are best suited for habitat and streamway preservation, left undisturbed and largely unroaded. Access into the loop near the south end of the unit presently provides some people with unauthorized camping opportunities. A trail system through the unit would offer seclusion and nature study. Beyond the Streamway Corridor continued agricultural pursuits are favoured.

UNIT K - 2:

This is clearly a pastoral segment of the valley. All cultivable lands have been cleared and now produce crops. Next to no streambank vegetation remains and all amenity values are very low. One farmstead associated with a livestock operation occupies part of the immediate shoreland, a location which is a threat to the water quality. The lower end of the stream in this unit has a concrete slab weir installed to impede or back up the water for the Bailey Selburn pumping station. This installation is inconsistent with the principles of healthy stream management and is very unsightly. Overall this unit is considered best for continued agricultural use. However, establishing a Streamway Corridor would provide improved conditions along the watercourse for wildlife, fish and even public use.

UNIT K - 3:

As the valley sides steepen and the channel deepens, the erosion hazard increases and the need for bank stabilization becomes more pronounced. Fortunately, this unit retains a large amount of the tree cover and no intensive uses presently occur in the fringe area that would become the Streamway Corridor. Some undesireable bank clearing has been done, but generally existing cultivated areas on the floodway may continue in this use. Several point bars offer reasonably attractive wading beaches and shoreland bluffs present potential for walk-in camping. Beyond the river breaks, there are at least two locations suitable for active recreation facilities. Overall, the valley part of the unit is most suitable for passive recreation and preservation, while the upland could handle some active recreation facilities as well as continued agriculture.

UNIT K - 4:

The most distinct characteristic along this unit is the outflow from Cremona Creek. Since the hamlet of Cremona uses the creek to carry off its lagoon effluents periodic contamination in the Little Red occurs. Part of the west valley side is gullied by erosion and quite prone to continued erosion. This area requires protection from clearing and exploitation. No developed access leads into this unit but the valley does offer some pleasing esthetic experiences. Here too, however, the bank vegetation has been partially removed, a practice that will be unacceptable under future management controls.

UNIT K - 5:

Except for a narrow trail leading to a cabin next to the stream, this unit retains most of its natural integrity. It demonstrates conditions such as ought to prevail along most of the streamway. The mixed aspen and spruce tree cover offers shade to the stream, habitat for wildlife, seclusion for public shoreland recreators and a stabilizing bond for the soil. Diversity and paddleability both rate favourably and suitabilities for preservation, passive recreation and active recreation are all demonstrated. The promixity of this unit to Cremona and the road link to that hamlet as well as to Highway 22, attracts greater attention to the potential of this unit for uses such as camping. Through this unit and the entire run, strong consideration should be given to establishing a pedestrian and bicycle trail.

L - RUN: STONY CREEK:

The scenic riverscape through this run possesses a consistency and congruency and is dominated by the most diverse and irregular distant landscapes in the study area. Throughout this run there is a need to establish a conservation corridor (Streamway Influence Belt) to protect the streamway as a public resource, incorporating a continuous trail system. Several unique and fragile assets occur that will require special landscape planning especially next to the North Water Valley Bridge, and along the entire right hand valley side. There are several opportunities (locations) where recreation facilities could be developed. Also, consideration should be given to the potential to view and appreciate diverse and interesting landscape views up and down the valley. Many of the valley flats are used for agricultural pursuits, including grazing, forage production and grain crops. Had some of these flats remained in natural tree cover, they could have been developed into superior quality campgrounds. However, except for streambank clearing existing land uses through this run are causing few problems.

UNIT L - 1:

General comments for the run apply to this unit. Apart from the implimentation of the Streamway Corridor, future management should continue past practices. As trails are developed for public use, a rest stop and possibly a walk-in campsite should be provided in the small river loop midway along the unit.

UNIT L - 2:

The dramatic dimensions of the river valley become evident in this unit. Here too, the possibilities available for recreation are clearly evident as the combination of relief, water and tree cover are brought together in one site. The site conditions present on the Camp Valaqua Property are unsurpassed for providing a pleasing, functional and non-fragile recreation facility. Under no circumstances (except where the supply is extremely excessive), should comparable sites be released to non-recreational functions. The North Water Valley campground, although conveniently located has not been adequately planned and so it lacks appeal. If well laid out and linked with valley amenities by way of walking trails it would have greater appeal. The heavily treed upper slopes on the right bank of the valley, particularly near the large U-shaped loop in the river has some potential for cottage uses, but steep valley sides should be maintained in their natural condition. One pipeline crosses the valley and there was an old suspended foot bridge used to span the river on the Camp Valaqua property. Although the Little Red can be forded at many locations, development of these suspended walkways should be encouraged at certain locations particularly where larger numbers of users would take advantage of them. Three gullies channel seasonal runoff from the south into the Little Red in this unit. North of the river, almost all of the available land is in agricultural production, and it should remain so.

Looking east across the L.R.D.R. Valley in L-Run

M - RUN: SILVER CREEK:

Between the North Water Valley Bridge and the West Water Valley Bridge (Silver Creek confluence), the valley of the Little Red retains its impressive dimensions and although well entrenched and following a long looping meander pattern, the stream channel itself maintains its tightly meandering pattern. This situation suggests that along this part of the valley, the post-glacial river was far larger than this present stream. The north facing slope of the valley retains a heavy natural spruce forest cover, while the south facing slope is less

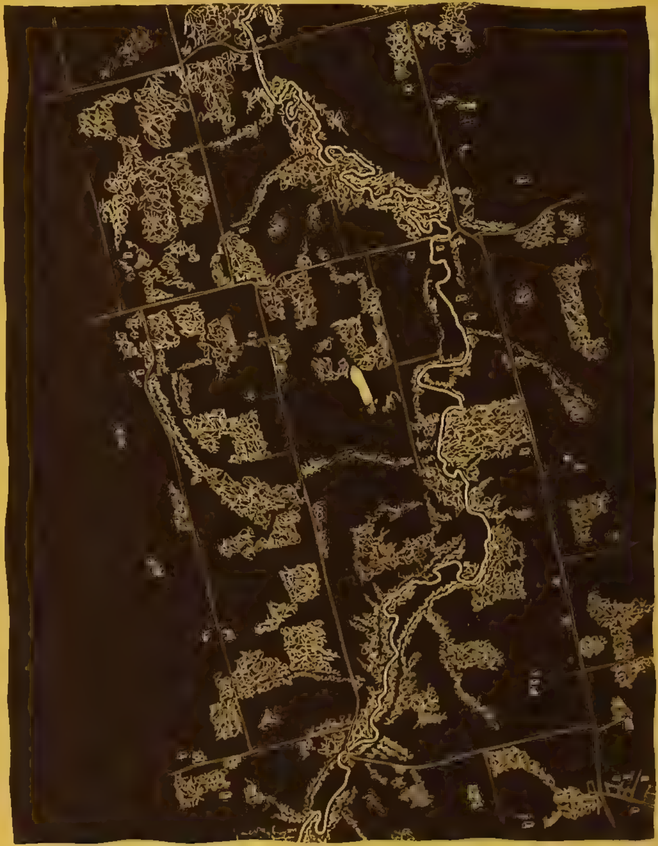

Figure 18 CREMONA RUN

densely forested and carries a greater concentration of aspen. Soil stability is quite low and prone to erode if the vegetation is removed from the steep valley side slopes. Little of the shoreland vegetation has been cleared along this run, but where it has, the floodplain seems to have attracted highest priority. Above the valley sides, some clearing is still progressing, but these clearings are still very patchy. The Little Red Estates Subdivision occupies part of the upper slopes on the right bank. Certainly this run is characterized by a diversity of natural conditions and scenic beauty that offer excellent opportunities for the planning of a balanced complex of shoreland uses, with generally the preference given to recreation. Near the confluence of Big Prairie Creek this run takes on conditions which are close to wilderness. Livestock grazing occurs throughout this portion of the valley.

UNIT M - 1:

Apart from the North Water Valley road, there is no vehicular access into this part of the valley floor. Near that road, part of the floodplain has been cleared and seeded to forage crops. The remainder of the valley is used for livestock grazing and habitat for elk, deer, beaver and waterfowl. As habitat, the unit is excellent. Except in unusually high flows, this portion of the stream is too shallow and rocky to navigate with canoe or kayak. The stream is so gentle and usually the flow is so low that beaver have constructed several embankments across it. Above the main valley wall on the right bank, a cottage subdivision is being developed. The slope of the land is fairly steep at this location, but the sense of seclusion is good. Surprisingly however, these lots have not all been developed and even among those that have been, site standards are not very high. There has been a waste of space resulting in a sprawling and uncoordinated atmosphere. However, the site amenities are generally suitable for this function. The main attributes of the unit are seclusion and diversity and fragility is a restricting concern, particularly on steep slopes. The evaluation rates this area highest for passive recreation followed by preservation and then active recreation. A trail for non-motorized uses should be considered part of the total design concept in this unit.

UNIT M - 2:

The riverscape corridor available along this unit contains the only instance of a streamside roadway available along the Little Red Deer River. As a result of this roadway, access along the entire left bank is convenient and enhances land use. In response to this accessibility, the available flatlands were occupied early in settlement history, as evidenced by the old log buildings and the cleared fields surrounding them. In spite of this, the valley bottom retains a number of natural and esthetic qualities suited to passive recreation uses and wildlife. Livestock currently graze through the entire valley, and apart from their contaminating wastes, have caused few problems. Implimentation of the Streamway Corridor will prevent this and other livestock induced problems in the future. Not only does a roadway cross the valley at the upper end of this unit, but a pipeline crossing exists near its lower end. Apart from a cleared right-of-way, no problems are created by this facility. Silver Creek, which enters the river just below the West Water Valley bridge has a low volume flow but adds variety and scope to the opportunities for activity. Its valley and vegetation, though subjected to fairly intense activity in early decades, now present an almost wilderness character. This is a prime example of the extent to which restoration of any other encroached or disturbed shorelands can be reclaimed both naturally and induced. The steep slopes should not be subjected to development in this unit, but the valley flats are suitable for passive forms of recreation and the gentler, forested upper slopes are suitable for either private or public recreation facilities such as campgrounds, cottages or resort type commercial facilities. The old log buildings seems to have some potential for preservation and certainly a foot or cycle trail linking the two ends of this entire run would be more than desireable.

N - RUN: WATER VALLEY:

This run (10 kilometers) is distinguished from other runs by its relative isolation and absence of regular automobile traffic. It is this relative isolation, together with a diversity of natural resources and scenic beauty, that offers rich opportunities for planning a balanced complex of shoreland uses. The forested foothill landscape comes into clear evidence along this run, and the river floodway takes advantage of an old valley through these hills. The meandering channel (15 kilometers) has developed a distinctive flat floodplain well supplied with an overlay of silt enriched soils. These have attracted the livestock operator who has developed the forage producing potential of them by clearing and seeding to improved hay. As civilization advanced some old ranch operations have been abandoned as adjacent ranchers expanded but the intensity of use for livestock has increased. Throughout this run, both valley sides are fairly steep and heavily forested in spruce. Several tributary channels of seasonal flow enter the mainstream, while carving diversity into the landscape.

UNIT N - 1:

Between Silver Creek and the Green Area boundary (10 kilometers), there is a shift from characteristics of an entrenched spillway (carved by the continuous action of flowing water) to characteristics of an aggrading floodway in an over deepened preglacial valley. From the standpoint of planning however, this lower part of the run is best understood as a transition corridor from settlement to unsettled real estate and from agrarian to forest based development (or use) and from plains to foothills physiography. Topography is mostly sloping to steep, tree cover is almost continuous and soils are lacking in productive capability. There is an increasing level of scenic appeal, both locally and in distant vistas and a considerable opportunity for seclusion and nature appreciation exists. The stabilizing importance and role of the tree cover must be stressed but also its value for providing wildlife habitat must be recognized. The unit can and should continue to have a significant livestock supporting function but the Streamway

Corridor concept must be applied to restore integrity to the streamway and its immediate shorelands. Very little encouragement should be given to commercial timber harvesting or to increasing the amount of cleared land for agriculture along this unit nor within several kilometers of the river. Rather it would be appropriate to focus on the potential of these resources to supply and enhance recreationally oriented uses such as camping, cottageing and private or institutional lodge type facilities. The floodplain should however be exempt from facilities susceptible to flood damage. The present Study discourages private residential subdivision in the Green Area. The evaluation matrix indicates active recreation as the most appropriate allocation for the unit. It also needs to be stated that this unit is within a convenient driving distance of Calgary via Highway 22 and as a result there is an increasing interest in the possibilities for cottage development here. Overall, this unit and its up and downstream counterparts lend themselves to an excellent varied complex of active, passive and preservation uses, equal to anything elsewhere in the entire Little Red Deer riverscape.

Unit N - 2:

The characteristics of this unit are not greatly different from those in the previous unit except for the management constraints which are in effect for the Green Area of the Province, the administrative role of Improvement District #8, the planning mandate of the Calgary Regional Planning Commission, and the recent Policy for Resource Management of the Eastern Slopes. Because of these administrative distinctions, this Study has not gathered the same detail of information here and for other units in the Green Area. However, sufficient study was done to generate positive land use and management recommendations. Again in this unit the floodplain has been converted to improved grazing and forage cropland with considerable tree removal adjacent to the streamway. Otherwise, or with the exception of occasional haystacks, nothing is located on the floodplain. However, by including the lands surrounding the Grease Creek confluence in this unit, mention must be made of the cattle and guest ranch located at that site. No detailed evaluation was made of this operation, which, although in the Green Area, is on patented land. It is however, based on the superb esthetic resources of this foothill setting, the suitability of these lands for livestock grazing, and the policy of Alberta Energy and Natural Resources which encourages the use of forest lands for grazing domestic livestock. The primary concern expressed herein relating to this operation is the wintering (feeding) and watering of the cattle. The guidelines and standards listed elsewhere in this report should be equally applied here. Along this unit there is one small bridge spanning the Little Red and providing vehicular access to the east bank and thence south past Lost Lake eventually reaching Highway 1A. Factors of diversity and fragility dominate the inventory, but because of the forest and range capability there is a significant score for economic uses. Passive recreation is highest and this is based on the amenities of seclusion, vistas, remoteness, fishing, trail uses and wildlife viewing or hunting. Present access is not adequate for public use but, as it is, the benefits of remoteness are maintained without being separated by great distances. There is a considerable potential for public recreation farther upstream along the Little Red Deer valley however, and the most convenient route of access to that area would be along the roadway leading into the guest ranch referred to above. Although some improved access may be appreciated by the ranch operator, he would be inconvenienced by the advent of scores of recreators who may have little regard or respect for his property, rights and privacy. This adds emphasis to the recommendations presented below for the Lower Grease Creek Reach and the adjacent unit along the Little Red.

O - RUN: GREASE CREEK - TRUNK ROAD:

This run, comprised of only one distinct unit (although another division could possibly be made at the confluence of Salter Creek) contains the longest fixed channel type within the Little Red Study. The entire run has a relatively high biological fragility, which, together with difficult channel accessibility, make this area highly suitable for a combination of preservation and passive recreation uses. Although the channel characteristics of this run are not useable for either floating or wading, it does contain high values for trails, scenic viewing and fishing. The concentration of diverse natural and scenic characteristics, the relative isolation of this area, as well as its link with the Trunk Road, combine to make this a superior recreation resource of considerable size, relatively undisturbed along its channel and naturally suited for consideration and development as a preservation/recreation complex. No major tributaries enter the Little Red along this run, but numerous local drainage channels

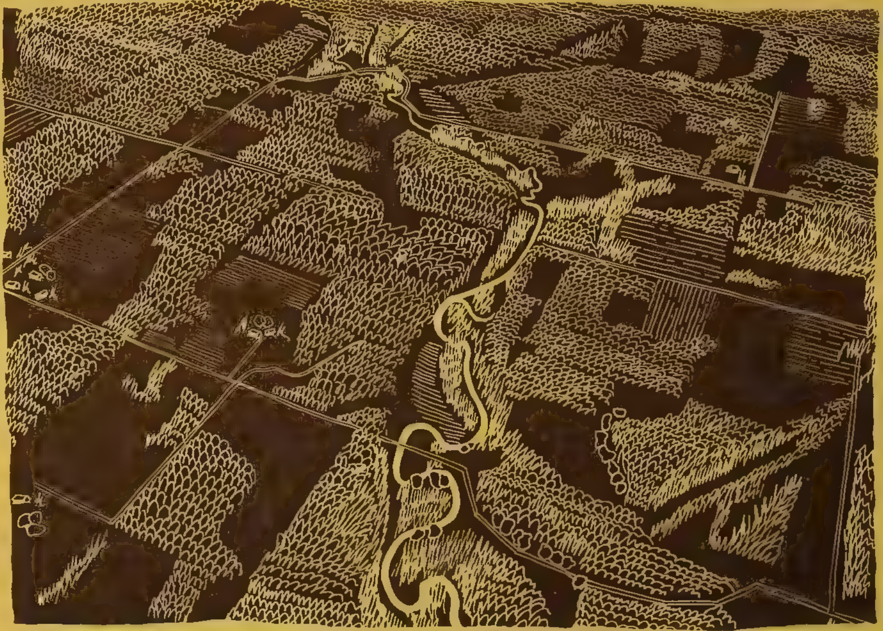

Figure 19 SILVER CREEK RUN

and seasonally active watercourses contribute to the system. Some of these, particularly Alkinson Creek and Salter Creek lend an added dimension to the recreation opportunities. These remote, meadow carpeted valleys offer adventure and discovery and the surrounding ridges invite surveillance. Some vehicular access is available, largely as a result of mineral exploration activity, and those roads should be maintained as they provide access for recreational users. Some of these roads lead to, or may be extended to superior shoreland locations where facilities for public use could be developed. Presently the Harold Creek road, leading from Water Valley to the Forestry Trunk road, parallels the upper 4 kilometers and provides access from both east and west. Two four-wheel drive roads extend to the Little Red from the Harold Creek road, one approximately 7 kilometers upstream from the Grease Creek confluence and the other about 8 kilometers downstream from the Trunk Road. A road of similar quality brings access in along Salter Creek. It would be appropriate to upgrade the road closest to Grease Creek and extend it westward along the valley and connect it by a bridge across the Little Red to the Salter Creek road which should also be improved for two way truck traffic. This part of the valley could then be developed with public recreation facilities. The point where the third truck trail meets the river offers excellent opportunities for either public or private back country accommodation (hunting and fishing lodge or winter snowmobile base or an institutional retreat facility). Between the Trunk Road and the point where the Harold Creek Road swings away from the Little Red the valley is suitable for snowmobile use. The more downstream segment should not be subjected to these machines, however, because of the superior wintering habitat for elk and other wildlife. Between all of the points referred to above, a continuous trail system for hikers and cross-country skiers would be desireable. There are no major obstacles to foot access along this run now, yet an improved trail, especially at stream crossings would be beneficial.

This entire run penetrates moderately productive coniferous forest, (C.L.I. Class 5). No harvesting is underway at this time, nor has the area any history of timber harvesting. Until such time as a large scale pulpwood operation acquires timber rights for the area, or until the present crop of spruce and pine mature to average saw-log dimensions, no timber harvesting of much magnitude is expected here. Meanwhile, livestock grazing is continuing as the prevailing renewable resource use of greatest significance. The boundary line of significance here is the Forest Reserve boundary which crosses the Little Red at the point where Atkinson Creek meets the Little Red. A grazing allotment covering 28,384 acres occupies that part of the Little Red Deer watershed located in the Forest Reserve. Until recently the allowed grazing pressure was set at 1001 A.U.M. (Animal Unit Months), but the range deteriorated due to overuse and inadequate management practices. Currently only 538 A.U.M. are permitted until range conditions improve. The downstream end of the run is held under grazing lease. On these lands the lease holder has longer tenure and more individual management freedom. Definite problems are associated with poorly managed use of forested shorelands by domestic livestock. There is therefore a definite need to avoid concentrated grazing and trampling of narrow valley bottoms and trampling of bank cover which induces erosion and siltation. Oil and gas activity has been active and at least three potentially productive gas wells are in the area but are capped. Sport fishing is moderately good but, if it is to improve or even be maintained, all forms of erosion inducing and water contaminating activity throughout the watershed will have to be controlled.

Reference to the inventory shows diversity to dominate all values while uniqueness and fragility are also high. The evaluation scores place preservation and passive recreation highest with both the valley and backland areas rating well.

P - RUN: LITTLE RED HEADWATERS:

West of the Forestry Trunk Road, there is no distinct single channel that constitutes a river. Here several small steep fixed channels progressively merge while draining a small, but steeply sloping forested mountain side. There are no flood plain flats nor any grassy meadows, but rather a continuous blanket of coniferous forest. The distance between the headwater divide and the bridge on the Trunk Road is about 5 kilometers. Forest management practices for the entire watershed (area) need to adequately reflect concern for visual esthetics experienced by motorists on the road; the requirements needed to prevent contamination of the water or impairment of its flow characteristics; the presence and needs of wildlife and the potentials for resource uses. This unit does not offer superior recreation assets other than seclusion; however certain recommendations are made. Some potential for public camping is available near the road. If this is developed, it should focus, not on the qualities of the stream, but on the opportunities of the area. A trail for hiking up to the Mockingbird Lookout tower would be invigorating and provide its users with a grand panoramic view to the western mountain ranges beyond the Waiparous Valley. The resource road developed up the ridge to the east of the Trunk Road also offers the less ambitious camper an opportunity to drive up to the top of the ridge and view the scenic foothills from his car or truck. Since conditions in this area are not excessively fragile, public access should be accommodated along this road. Snowmobile traffic should not be permitted west of the Trunk Road in this unit.
In recognition of the multiple use potential of this entire area, the paramount concern is that, as resource harvesting is pursued care needs to be exercised and operations regulated so that other values will not be lost and the area befouled during a generation of recovery. Again, diversity has the highest rating, but seclusion, fragility and uniqueness are high. The evaluation suggests passive forms of recreation and preservation again should dominate management choices.

Q - RUN: LOWER GREASE CREEK:

The lower Grease Creek run is about 15 kilometers long and comprises two quite different units separated by the bridge crossing of the Harold Creek road. Access into the upper unit is unrestricted but the lower unit has only limited access from the Harold Creek road and then no access at all except for the road into it from the south at its point of confluence with the Little Red Deer River. The creek along here is quite small and its flow fluctuates seasonally, but it is recognized for its sport fish, beaver and wildlife populations.

UNIT Q - 1:

Although access is good from the south to the lower end of this unit, the bulk of the valley is isolated. A steep walled and narrow valley along part of its length and a sinuous channel combine to bring a character of diversity and seclusion. Most of the hillsides are well forested and the meadows are quite confined offering less than ideal forage for livestock. Some improved forage has been developed near the bridge. The valley affords the guest ranch at its lower end excellent trail riding landscapes, while also offering shelter to elk, deer and moose. Uniqueness, fragility and seclusion rate highly and the evaluation favours preservation and passive recreation. No development for either public or private recreational use are encouraged in this unit. Livestock grazing is considered acceptable although streambank use areas must be regularly monitored and damage sites fenced off. All of this land is currently held under grazing lease by nearby ranchers who may own as little as one half section, but lease several sections. Although grazing leases bestow considerable management autonomy to the lesee, the lands are still the property of the Crown and accessible by the public. At some future time tree harvesting can be expected to introduce its impact on this unit, but even that need not deprive this valley of its character.

UNIT Q - 2:

Very little similarity exists between this unit and the one just described. Here the valley is broad and quite level, and the valley sides are low. In response to these conditions most of the shorelands west of the channel have been cleared and put into crops. Except for some of the less well drained or irregular surfaces, even the floodplain has been completely converted to productive cultivation or improved grazing range. Amenity values are very low along this unit other than the appeal of isolation and mountain vistas. Good access exists from the east along the Harold Creek road leading from Water Valley and this extends on westward connecting the unit with the Trunk Road. Just 2 kilometers west of the Grease Creek bridge, a truck trail swings south to the Little Red Deer River. As a result of the unit's inherent capability and the modifications made to it to enhance the arable acreage, little incentive exists for alternative forms of use. There is genuine cause for concern with respect to the immediate streambank clearing and cultivation and so additional emphasis is made for a Streamway Corridor along this unit.

R - RUN: UPPER GREASE CREEK:

This run demonstrates a shift from an open, accessible, convoluted stream valley to a narrowing almost inaccessible forest draped channel set between the natural folds of the bedrock formations and shifting again to the fixed, headwater stream searching its way down from the uplands across the various upthrust ridges which are projected at right angles to it. The entire run is essentially inaccessible by conventional vehicle and little, if any human alteration is evident on the entire landscape. Nearly all of this run is in the Rocky Mountain Forest Reserve.

UNIT R - 1:

This unit extends 8 kilometers along a northwest to south-east axis parallel to the upthrust foothill ridges. It occupies a broad valley which appears to have been broadened by ice scouring and flattened by subsequent infilling by stream transported gravels. The thin soils present over the coarse underlying materials are formed largely from silts and these support a combination of organic and grassland meadow vegetation. Elevated islands of tree covered knolls also occupy small parts of the valley. Grease Creek's channel is quite small and its course is very tortuous, its gradient shallow and its banks devoid of tree cover. It is accessible throughout to the livestock and wildlife that graze the valley grasses and drink its waters as it is quite shallow except for isolated sites. One small parcel near the confluence of Harold Creek is in private ownership and forms part of a rancher's base holdings. From that area a truck trail extends along the valley and is not considered available or negotiable for public access. The bulk of the local relief present is in the form of the long, straight ridge along the western side of the creek. That part of the unit which is in the Forest Reserve forms part of the Harold Creek Grazing Allotment, and certainly the most reasonable domestic or industrial

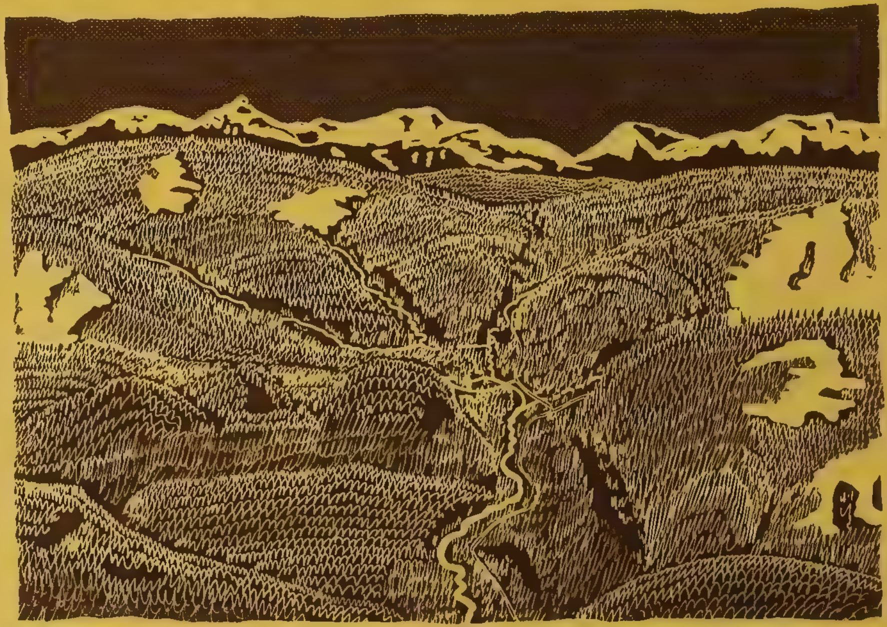

Figure 20 LITTLE RED HEADWATERS RUN

useage of this unit is for livestock grazing. The carrying capacity is low however, and the stream banks are fragile. As a result, some damage may occur and where particularly fragile conditions do exist and where excessive damages are occurring fencing should be used to exclude livestock. Unfortunately, the problem of livestock wastes entering the waterway cannot be prevented except by totally excluding livestock access and this is not considered feasible nor is the problem sufficiently serious to warrant it, particularly since there are no domestic uses or water contact recreational activities along or immediately downstream from this part of the stream. Sport fishing has some potential here (and this too is affected negatively by livestock access) but the unit is not currently popular for fishing due to its low amenity rating. While recognizing the general acceptability of this unit for livestock grazing the evaluation matrices emphasize preservation of its natural values as ungulate winter range, its fragile soil and vegetation and its water yield function.

UNIT R - 2:

The true headwaters of Grease Creek are contained in this unit. Three parallel foothill ridges are bisected by the creek and its most significant branch causing distinct gaps. A fourth ridge and the one farthest west in the Grease Creek watershed is gullied by several of the most headward tributaries. The drainage here is clearly controlled by bedrock and assumes a dendritic[26] pattern. A fixed channel in the youth stage completes the physiographic description. All segments of the channel in this unit are distinct and clearly incised into the landscape. Most of the watershed here is forested with conifers although several substantial valley meadows occupy the valley flats. Occasional seismic lines cross the unit at oblique angles and one resource access road has been developed between the Harold Creek Road in the south to link with Fallentimber Creek to the north of this unit crossing both the north and south branches of Grease Creek. No well-sites are present here, but this road is potentially capable of carrying semi-wilderness traffic into this remote, semi-secluded and rather scenic area. Such accessibility would lend opportunities for fishing, and isolated camping with only basic facilities required at either of the stream crossing locations or at Fallentimber Creek. This area is part of the Harold Creek Grazing Allotment so domestic livestock are grazed during summer months on the available forage. The potential is relatively low for this use. At this time no harvesting of the timber is taking place although the area is rated as having a capability to produce commercial quality timber. In the future, there may be a considerable demand for the timber available from this part of the watershed. As the merchantable stands are harvested the primary consideration must be the retention of water quality and fish habitat, but the harvesting operations should also be planned so that the recreational attributes present here will be protected. The inventory and evaluation matrices record high values for uniqueness and fragility and indicate preservation as the preferred management objective.

S - RUN: HAROLD CREEK:

What has been said to describe and discuss O-Run could be largely repeated for this one. The most conspicuous, and certainly the most significant difference is the presence of the dry-weather road which parallels Harold Creek along much of its length. As a result of this road public access is both convenient and common and so the accessible portion is seen and used by people traversing the valley and by recreators going to a particular site along the valley. The Harold Creek road provides access for ranch operators and forestry staff, as well as for mineral workers and wildlife personnel. It is becoming a fairly common link in a circle route for either day or weekend trips long the Trunk Road, Highway 1A and Highway 22. Only the extreme headwaters segment (10 km) is not quite accessible using conventional vehicles, and even that area is accessible by pick-ups or four-wheel drives. Outside of the Forest Reserve the shorelands are either privately owned or held under Grazing Lease. In the Reserve, all of these lands are Crown owned but grazing rights are held for the forage. It is part of the Harold Creek Grazing Allotment which is small but in good condition. The entire valley bottom along this unit offers superior ungulate habitat, especially as winter range and therefore, some conflict with domestic livestock is possible. Similarly, the presence of elk on the meadows presents some potential for haystack looting on the ranches. Beaver inhabitat most of the lower parts of this unit and have successfuly dammed it at several locations. These dams present conflicts for the trout fishery since, although the reservoirs behind the dams provide a larger water body for the fish, there are negative results too. Stagnant water becomes excessively warm, silts settle out and smother trout spawning beds (gravel), invertebrates which are eaten by trout do not thrive there, and the habitat conditions for the less desireable fish species are actually improved by beaver dams. The potential for commercial timber harvesting is only moderately good along Harold Creek, but some stands would enhance any extensive operation which may eventually be initiated. Except for distant vistas, this unit lacks high quality amenity values, a significant amount of the shoreland integrity has been lost already and the inherent capability or appeal of the stream and its shorelands is quite low. Still, in recognition of the convenient access, the fishing success possible and the demand for public facility development along forested shorelands, it is appropriate to provide basic camping facilities along this run. Two sites are suggested; one being south of the creek and west of the road near the east bridge, and the second being south of the creek and road near the west bridge. There is also fairly attractive potential for either commercial or institutional lodge or cottage type facility development along the road and creek, particularly near and upstream of the west bridge. These facilities are not viewed negatively in the context of information surfaced during this Study providing the guidelines which have been presented are followed.

Overall this run, comprised of only one unit is considered a multiple use unit with a high emphasis on preservation of natural systems and their functioning. Both access and the multiplicity of forage, trees, natural gas and recreational amenities (vistas, wildlife and fish) offer management agencies a diversity of options.

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[26] The dendritic drainage pattern exists where all tributaries join the next higher order of stream at right angles.

Appendix `B´

APPLICATION OF THE ALTERNATIVES

APPENDIX B

APPLICATION OF THE ALTERNATIVES

THE GREEN AREA

The Foothills Region of the Little Red Deer Riverscape is so different from the Western Alberta Plains Region that it is dealt with independently. A rather detailed discussion is presented in the Generalized Potential and so, only comments related to applying the alternatives is given here.

First of all, mention must be made of the Percent of Mean matrix. Reference to it demonstrates that in every unit there is a significant potential for passive forms of recreation as well as high significance for preservation and active recreation. Besides this, the upland areas have equally high and frequently higher scores for these considerations. Considering these facts together with the essential absence of development throughout this region, the relative potential for developed recreation facilities is very great if compared to the Western Alberta Plains region. Continuous development along all portions of the valley, as would be inferred from the recreation alternative, would seemingly be possible. It is at this point therefore, where some insights into future possibilities and careful concern for preventive planning must be applied.

The recognized priority to manage the Eastern Slopes for their watershed function must be emphasized. No uses which jeopardize this priority may be permitted. Constraints are placed on timber harvesting, livestock grazing, road building, minerals activity and recreation to prevent disruptions in either the quantity or quality of water yielded from the area and even the timing of runoff is subject to protective management.

Many species of wildlife occupy the forests and meadows throughout the foothills. Although they do not have so essential or critical a value for human wellbeing and survival, as does water, each species of animal is considered part of the natural community and provides a richness to the total esthetic quality of the region. Most authorities also suggest that each species forms an essential link in the overall dependency chain. For these reasons, the importance of maintaining habitat conditions suitable for wildlife perpetuation is emphasized. River valleys provide traditional winter ranges, watering areas and migration routes for many ungulate herds and essential habitat for other species as well. These conditions need to be safeguarded.

The headwater and gathering portions of streams offer conditions which provide or help to provide a healthy sport fish population. Cold water, free from contamination, gravel bottomed, well aerated, rich in invertebrates and unobstructed, these watercourses are essential for fish spawning and fingerling survival. Unless the headwater and gathering segments of a river are healthy, the quality of the sport fishery throughout the length of the river will be unhealthy, except for non-migratory species. Sport fishing continues to interest more Albertans than any other single form of outdoor recreational activity. Most of the restraints used to safeguard the watershed provide all the control needed for the sport fishery also.

A fourth concern in the eastern slopes, and one that relates to streams, shorelands, lakes and uplands, is described as natural resource, non-facility based outdoor recreation opportunities. Because of its distance from urban areas, the scarcity of roads, the ruggedness of the landscape, the natural appeal of forested foothill terrain, and a policy of preservation applied by the various governments, the foothills region presents a recreation appeal difficult to document. A very large measure of that appeal relates to society's wish to find seclusion, participate in natural outdoor experiences and expose one's self to the risks or insecurities of being alone in nature's elements. This concern has merit and if it is to be realized such areas must be kept available. For this reason too, developing the headwaters and foothill region of the Little Red Deer Riverscape to the extent of its single function potential is not desireable.

In conclusion, therefore, the scores shown on the Percent of Mean matrix cannot be interpreted in isolation. They must be viewed in the context of the overall subregion and the concerns discussed above. When this is done, a rational management scenario can be prepared for any of the alternatives without abusing the total system and exceeding the impact even beyond that intended by the chosen alternative.

THE IMPLICATIONS OF THE CONSERVATION ALTERNATIVE

Overview

Many statements and studies have been made of rivers to determine their appropriateness for designation as a wild, scenic, or recreational river. In the United States, legislation has been passed requiring certain waterways to be protected as wild, scenic, or recreation rivers. Somewhat comparable legislation has also been passed at the provincial level in Ontario. In Alberta no such legislation exists. Use of the term "Scenic River System" here is not intended to imply that any legislated rating is invoked, but only to emphasize that, with this alternative, scenic resources are considered of equal significance to recreation or economic resources.

Although the overall management orientation here is for conservation, the Streamway Corridor as well as the Streamway Influence Belt are both applied to the Little Red Deer shorelands. However, the use of this alternative has the practical effect of extending the limits of the preservation areas. Sometimes the extension is linear, along the river, and other times, it is lateral, away from the channel. Wherever these extensions occur, land use is restricted to non-motorized use of trails, pack-in camping and carefully controlled livestock grazing. To some extent, snowmobiling is allowed, but must be confined to the frozen surface of the river.

Although many parts of the shorelands are denied all forms of development activity when the Scenic River System is introduced, there are still a significant number of areas where some measure of economic activity is acceptable and even where nodes of intensive development can either continue or be established. Then too, there are areas where corrective action is needed to improve the ecological/ environmental situation at the damage site and downstream from it.

Agriculture

Overall, livestock grazing is recognized as an accepted use on lands requiring conservation. Cultivation, too, is not regarded as intrinsically destructive to shoreland values. It is still deemed at best, a conditional use though, because of the common use of chemical pesticides, herbicides and fertilizers which all aggravate water quality. New clearing activities are tightly restricted by this alternative. Also, although cultivation is not considered destructive to shoreland values per-say, certain attributes of the valley character are much prized for alternate functions. The Conservation Alternative gives preference to those alternate functions.

Agriculture is not considered intrinsically destructive to shorelands.

Recreation

Although recreation opportunities are benefited by the conservation objectives, the intensity of recreational use and development is very much restricted by them. Even the more favourable locations may not be developed beyond the level of unserviced campgrounds. Also, excepting for the campgrounds, cottage subdivisions and country residential areas which now exist, none of these are permitted. Only the hamlet of Westward Ho qualifies for expanded or intensified residential development.

Two primary recreation nodes are cited along the river when this alternative is proffered. They are located in C-Run, including Red Lodge Provincial Park and the Silver Lagoon Subdivision plus the area in H-Run between the Nazarene Church camp and the Westward Ho campground.
Both of these nodes have excellent primary paved access and improved roads along their margins. As facility development proceeds, additional roads will be needed. In C-Run there are 125 basic camping lots and other picnic, playground and maintenance facilities already developed at the Park. This intensity of development exceeds the amount considered desireable for the conservation objectives, but no reduction is recommended. One farmstead on the west bank of the river in Unit C-3 is excessively close to the channel and its cattle have direct access to the water. This and similar operations need to be monitored and possibly constrained especially along those units with better amenities. The Silver Lagoon subdivision would not be permissible at its location if applied for following implimentation of the Conservation Alternative. In the present subdivision, the intensity of private residential development is excessive, and some of its units are too close to the channel and in the floodway. Overall, C-Run presents an unequalled habitat and largely unroaded area, well suited for non-motorized forms of recreation. All lands within 1 km of the river, and located east of it should be acquired by the Crown so they can be managed at public expense for both conservation and passive recreation.

H - Run requires similar management to that just discussed above. The Westward Ho campground is appropriately located but is haphazardly developed. No intensification is desireable, but handling of biological wastes must be very carefully monitored. No facilities for sewage (including pit toilets) should be located in flood prone or seepage prone areas and the total requirements of the Standards section of this report should be met. The Nazarene Church Camp occupies a very pleasant setting but some of the facilities are excessively close to the stream and some are in need of maintenance or grooming. Again, the sewage handling facilities are most critical due to their close proximity to the watercourse and the potentially large numbers of guests using the camp. As the camp is maintained and upgraded, the Streamway Corridor should be protected and natural tree cover should be maintained and encouraged to regenerate.

Any future development of recreation facilities in H-Run should be focused in the wooded area south of the river and beyond the valley sides. No intensive use facilities may be developed here, but there is capacity for approximately 120 basic campground lots. Although the flats across the river from the Nazarene Camp are currently used for agriculture, they and other valley floor areas should be returned to an unoccupied status. Existing country homes in this area are non-conforming.

A third area for a possible recreation node, centers around the North Water Valley campground and Camp Valaqua. Present development in that area is very modest and demonstrates a sensitivity to site conditions. Although the campground should never be developed beyond a maximum of 40 basic lots, some enhancement is desireable to reinforce the natural setting and to restrict vehicular movement. Camp Valaqua is discreetly developed above and back from the shoreline and has avoided indiscriminate tree removal and trash accumulation. As continued development proceeds, they are encouraged to adopt a firm policy (stand) to preserve the natural quality of this site, even though it requires what appears to be an excessive dispersal of facilities. One further component of this overall area is the Little Red Estates cottage subdivision. While this development occupies a high emenity landscape capable of supporting this form of use, it presents an appearance of haphazardness and a lack of standards. Although each lot is privately owned there needs to be a firm commitment to develop each lot to conform to pre-defined standards of architecture (adapted to the surroundings), and maintain the property and buildings free of refuse and blight. High standards of sewage handling are essential. Cottage subdivision is a non-conforming use in the Conservation Alternative. Trail development would be a complimentary pursuit along most of the valley and occasionally, canoeing is feasible along some reaches of the river.

Cottage subdivision is a non-conforming shoreland use under the Conservation Alternative.

Industry

While the major thrust of this alternative is conservation and scenic values, the ongoing industrial operations must be recognized. The natural gas industry, in particular, has left its mark on parts of the valley and its needs must be accommodated in the future irrespective of the management alternative. Adoption of a conservation bias however, makes the need to mitigate industrial impacts so much greater, but in any event, no industrial activity that threatens the healthy quality of the river water (through silt, chemicals, biological effluents, temperature change or impedence of flow) can be accepted. Where these threats are presented, guarantees must be offered and proof shown that the action needed to prevent damage will be taken. Weirs which obstruct fish migration are not acceptable, oil and gas wells must be beyond the 100 year flood line, pipeline crossings must be grouped in corridors, licencing of water extraction from the river must be restricted by the biological requirements of the river, and licenced volumes must be adhered to. Further constraints are presented in the Standards section of this report.

Wildlife

The importance of wildlife habitat is strongly emphasized in this alternative. Each segment of the valley appeals to its own wildlife community, but each is to be protected as well as managed. Beavers thrive along the river from the Trunk Road to the river's mouth. Deer are also common, along with grouse, pheasants waterfowl, elk, coyotes and in the west, moose and bear. Management means ensuring their survival and replacement by reproduction but it also includes controlling their impacts on the available habitat. Wildlife needs take precedence over domestic livestock within all areas not designated for agriculture.

Effluents

Handling and disposal of all forms of pollution causing effluents has been discussed previously, but the topic has its most common affiliation with a discussion of conservation. However, any requirements for pollution control specified for the Conservation Alternative are also intended for each of the other alternatives. This is because effluent and pollution control is not a land use issue but a water quality issue. Whether the use of shorelands is exploitative or conservative, along the Little Red, the water is to be kept unpolluted.

Municipal effluents from Bowden, Olds and Cremona enter the Little Red. Although regulations restrict the potency and timing of effluent release when a river is the receiving system, it is never without damage to the watercourse. Sewage fouls the smell and taste of river water, aggravates downstream users' treatment problems, downgrades the recreational suitability and impairs the stream's habitat supporting qualities.

It was further evident from literature and media reports that translation of sewage into agricultural fertilizers is beneficial and practical without being unesthetic when this is a part of the total effluent handling plan.

All installations along the river, including camps, cottages, feedlots, campgrounds, and industrial plants must be equipped with completely reliable sewage handling systems and located so that no contamination of the river is likely to occur even in the event that the system fails temporarily. (See the section of this report dealing with standards).

The Green Area

This is the only alternative where the "Alternatives For Land Use Matrix" can be applied without adjustment to the Foothills Region. Therefore, the uses opportunities shown there, behind Conservation, apply directly to the highest mean scores shown on the Percent of Mean Matrix.

Most of the valley floor, sides and upland should be kept exclusively for wildlife habitat, the watershed benefits they provide and such recreational pursuits as require no facilities. Existing roads should be maintained but not upgraded. Destination locations should be equipped with facilities of only a basic type for recreational camping (dry privies, firepits and tables). Off-road vehicle use is not acceptable except for the use of snowmobiles confined to the frozen river surface in units accessible by road. Trail riding and hiking, as well as ski-touring, are quite acceptable although commercial facilities at trail heads are not desireable. A warming and sleeping shelter located along the course of one or more of the channels would be an appropriate form of development.

Deeded lands which are under cultivation would continue as such, but no new clearing to expand the cultivated acreage should occur. Livestock grazing is allowed on deeded land, lease land or grazing allotment range. Streambank areas and ungulate winter ranges must be carefully managed though, so that damages are not caused by overuse, by domestic livestock. Units Q-2 and R-1 are especially suitable for grazing.

Within 1/2 kilometer of the streams, commercial tree harvesting is excluded. Elsewhere, logging is essentially approved with the overall proviso that all operating plans be developed with due consideration to minimizing road construction, soil erosion and esthetic damage.

While oil and gas development may proceed even when this alternative is preferred, certain special conservation efforts are required. First of all, all seismic lines, pipelines and abandoned roads must be reclaimed and camouflaged at roadway intersects so they will not become trails for off-road vehicle operators. Shorelands must be left undisturbed except for pipeline and road crossings.

IMPLICATIONS OF THE RECREATION CORRIDOR ALTERNATIVE

From what has been presented on the previous pages, it is reasonably apparent that the valley of the Little Red Deer River can be designated a recreation corridor. This designation will ensure the ongoing use of the river's shoreland resources for purposes and functions not commonly available away from the river (see again the definition of the Recreation Alternative)

Except for the constraints imposed by the Streamway Corridor, no shoreland area is entirely denied some form of development activity. Even preservation designations permit unserviced campground development. Numerous locations are available for serviced campgrounds, institutional camps or commercial recreation facilities. Seasonal use cottages are also acceptable in certain places, and new country residential subdivisions may be considered.

Even more significantly, the recreation corridor requires that conflicts between a recreational use and another use be resolved in favour of recreation. This type of conflict will only be recognized however, when the recreational use considered is appropriate for the site. This is determined by reference to the Alternatives Matrix. Then too, the intensity of development for recreation may be much greater with this alternative. For example, a unit which is suitable for a basic campground developed to a specified density for either the Conservation or Agriculture Alternative may be developed. to twice that density for semi-serviced or serviced camping using the Recreation Alternative.

Conservation

Pure conservation is not emphasized by the Recreation Alternative. As can be seen on the Alternatives Matrix, even preservation units are available for basic campground use. Isolating shorelands exclusively for wildlife habitat or unique feature protection is not specifically required. This is because the extensive or passive forms of recreation that will occur on those areas is not considered likely to impose high impacts on the site or excessive pressures on wildlife. Both can co-exist at low intensity without ill effects.

It is also evident from the Matrix that many types of use are forbidden on shorelands designated for preservation, and there are many of these units. Neither serviced campgrounds nor institutional, commercial, cottage, country residential, cultivation, or any other high impact activity is permitted at these sites. Their characteristics are to be conserved. Examples of these units are A-1, H-2, K-1, N-2. In large measure, however, the conservation emphasis in these units is intended to avoid actions such as would reduce the recreational value of those units. By listing livestock grazing as a conditional use in both preservation and passive recreation units this is demonstrated.

In addition to the fairly lenient conservation controls discussed above, the Streamway Corridor requires its usual strict protection clauses. This affects the entire length of the river without regard for backshore use. Within the Streamway Corridor, action taken that affects the channel itself is regulated by the management guidelines stated previously and by the principles given below under the Industry Section.

Recreation

Between the Green Area boundary and the confluence with the Red Deer River, the following recreation facility potential is available if the Recreation Corridor Alternative is considered.

- 9000 basic campground lots and 350 cottage lots, or
- 2500 basic campground lots plus 5000 semi-serviced and serviced lots and 350 cottages, or
- 2500 basic lots, 350 cottages, and a combination of serviced and unserviced campground lots, institutional camps and commercial recreation accommodation not to exceed the equivalent of 5000 serviced camping lots.

Although the Recreation Corridor implies that the recreational potential of the river valley is available for the development of recreation facilities and for recreational activities generally, four primary recreation nodes are present. Each of these presents a combination of rich amenities extended along at least an entire run, and therefore presents opportunities for a variety of facilities and activities. Also, these nodes are separated from each other by a significant distance and are therefore available to users and residents from various places in the hinterland. The four nodes are: A-Run; C-Run; H-Run; and M-Run. All four are located in the Western Alberta Plains Region. Suggested priorities and level of development for the various nodes are:

1. A-Run should be restricted so that the highest quality of facility is the basic campground the maximum number permitted in the Streamway Influence Belt is 450 lots. Until the need for their development is clearly evident, no facilities should be supplied in Unit A-1. Keeping that segment free of facilities reduces the maximum to 290 basic camping lots.
2. C-Run ought to be planned as a total recreation complex for public use. The Silver Lagoon sub-

division is not a public area but it does form the one end of a possible development continuum ranging from preservation areas through intensive use. Along the Streamway Influence Belt, there is a development potential for:

- 480 basic lots for camping or else 250 basic lots and an additional 400 semi-serviced and serviced campground lots besides the cottage subdivision. Red Lodge Park already has about 125 unserviced lots, but the density of use in that area is considered to be excessive.
- In order to use the total recreation resource in this area, it will be necessary to improve and extend access roads on both sides of the river and possibly provide a single lane bridge over the watercourse so that both sides can be managed as a continuous and linked system.
- Beyond the immediate shorelands, particularly east of the river and also the shorelands in D-Run, the recreational attributes should be regarded as an extension of C-Run's management complex. No additional country residential development or cottage subdivision is appropriate anywhere along this part of the valley.

3. H-Run, which is the entrenched part of the channel between the Westward Ho bridge and the Nazarene Camp bridge presents a unique potential for recreation. Still, because of its uniqueness there needs to be special sensitivity and discretion by management. In addition to the existing church camp in the valley, there is the following recreation use potential:

- 500 basic camping lots, or
- 400 basic lots and 320 semi-serviced or fully serviced camping lots.
- With either of the above options, there is also a potential for an intensively developed area for cottages and commercial recreation facilities on the wooded upland south of the river, and additional institutional facilities in the valley. Some amount of country residential subdivision south of the river but north of Highway 27 is also permitted.
- This total development, when considered together with the service facilities at the Hamlet of Westward Ho and the Westward Ho campground which is already developed, has the potential of servicing a large part of the total recreation demands presented from nearby residents and those induced by good highway access.

4. M-Run occupies a location of transition from mostly agricultural land use to forest land use. The river valley continues to offer the local relief wanted for immediate and distant vistas while the water in the river supplies the basic magnetism of the area. Heavier tree cover offers better seclusion and an atmosphere of naturalness. There is no distinct break between the upstream and downstream runs other than the bridge and roadway which have been selected to form an artificial boundary. Still, because of its rich endowment of natural amenities as well as its high accessibility, this Run should be recognized as a high priority location for recreation and it should form the focal point of recreational activities for the vicinity.

- M-Run has a potential for a combination of recreational facilities. Some cottage lots have been developed and there could be more. Either or both institutional and commercial accommodation may be supplied and a large range of public use accommodation and activity facilities is permissible. The following capacities are suggested.

- up to 400 basic campground lots, or
- 275 basic lots and 600 serviced or semi-serviced campground lots.

In summary, these four areas should form the focus of all recreation development along the Little Red for the foreseeable future. Once they are developed to the suggested capacity other sites along the river may be exploited. Such sites have already been identified and these are to be managed so their potential for recreational functioning in the future will not be impaired. Besides these nodes, the Recreation Corridor will accommodate several small recreation places in the valley, some having very high localized capability. Also, along most of the streamway, it would be desireable to have a system of trail linkages which tie the nodes together. These trails would borrow from the benefits of seclusion, scenery, proximity to water and physical refreshment available along the valley. They would be primarily intended for walking and ski-touring but equestrian trails are also appropriate. Snowmobile use is also appropriate along these internode segments but their use should be restricted to the ice and snow covered river channel except where the shorelands are devoid of vegetation or where snowmobiling is approved by the land owner.[27] Along the node areas snowmobiling should be kept strictly to the river channel except at designated loading and unloading sites where the operators may park their vehicles.

Institutional Facilities:

Three major church camps have been developed along the Little Red Deer River. Two others of smaller scale are also present. The Calgary Public School Board maintains an outdoor education centre west of Water Valley and two institutional groups use other sites along the valley. The shoreland and valley amenities desired by these organizations are a combination of rural setting, seclusion or isolation, privacy and space suitable for programmed activities. Access to water is almost always wanted. Although the church camps are defined as private facilities, all of them accept campers without any denominational screening. They tend to be public oriented service organizations operated under subsidy and intended to offer positive character influencing environments and programs mainly for youth. Although each has its own denominational affiliation and concentrates on different programs

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27. It is suggested that snowmobiling on privately owned farm land should only be permitted at the invitation of the owner, or with his permission. Uninvited or unpermitted use of snowmobiles on these lands should be recognized as a tres pass violation even if the property is not posted. Where such violations occur, the landowner should be within his rights to sieze the snowmobile being illegally operated on his land by means not requiring hurt to the violator's person. The siezed vehicle would thereafter be delivered to the R.C.M.P. together with a statement of the violation. Similar action is recommended where tresspass occurs involving off road vehicles and camping equipment.

or activities, their goals are quite similar. There seems to be general agreement that these camps have a rightful place in our society.

The form of development and the specific placement of certain facilities in these camps may not be pleasing to certain people, and they may not evidence strong environmental sensitivity. In part, this is because of their age, having been developed under a less sensitive set of standards. Also, these facilities tend to be managed by seasonally appointed personnel whose competence is with programming rather than with landscape design. Often management and help is entirely on a volunteer basis from people with worthy intentions but lacking in skills. As a result, both design, and construction may be substandard and so the amenities of the site may be abused. Where these facilities were assembled during a less affluent era, and where funds tend to be channelled more toward services than facilities, the quality of materials and permanency of design has also suffered.

Along the Little Red Deer River there are several locations where conditions are equally suitable for institutional recreation facility development as those sites already developed for that function. Furthermore, very little criticism of the standards and quality of development is justified against any existing institutional facility along the Little Red. Therefore, this plan makes generous provision for the continuance and duplication of this type of development. However, it is recommended that all future institutional camps be required to meet minimum standards of design, construction and operation. These standards will prevent site deterioration, environmental defilement and user dissatisfaction.

Agriculture

No agricultural production is acceptable in the valley portions of the four recreation nodes. Livestock grazing is a recognized conditional use but only until facility development is initiated. However, if livestock use is removing understory and ground vegetation and thereby preventing replacement trees from growing, the cattle should be removed from these areas. Elsewhere along the river, preservation, passive recreation or active recreation areas are available to livestock on a conditional basis too. All valley floor areas currently cultivated for crops but located on sites depicted as preservation, passive recreation or active recreation will be returned to forage grazing until their recreational amenities are to be developed.

Even when recreation is the first priority along the Little Red Deer River, much of the valley may be primarily regarded as agricultural. In addition to grazing opportunities provided on areas principally intended for preservation functions or future recreation functions, many parts of the valley are best suited for ongoing agricultural use. Particular examples of these are F, I, and J-Runs. These areas permit the grazing of domestic livestock throughout, but also may be cultivated providing a development permit is secured.

As is mentioned elsewhere, the major concern about cultivation of shorelands centers on the potential for soil erosion but there is also a lot of evidence that agricultural chemicals are poisoning the water. From a recreational perspective, the result is a declining fish population so poorer fishing success, algae growth and the resulting discoloration and foul smelling water. Additional clearing of the tree cover is only allowed by a development permit. These permits should be granted in all instances where agriculture is the indicated use on the Generalized Potential Map if site conditions are favourable for cultivation. Again it is reiterated that the Streamway Corridor restricts agricultural uses close to the water's edge.

The constraints on feedlots and cattle watering generally need to be more rigidly enforced for the recreation alternative than for any other. Livestock effluents are always detrimental to watercourses, but when recreational uses are concentrated along that watercourse there is so much greater need to keep the water free of all quality eroding influences. Feedlots are not unilaterally excluded from the Streamway Influence Belt, but they probably should be. While they are listed as a conditional use in agriculture and development units, their presence there is not desireable. Granting of a development permit must follow adequate provision for the collection and retention of all effluents and thereafter for their disposal. Direct runoff into the river or its tributaries from the confinement of feeding areas is not acceptable under any alternative, but especially so if the recreation corridor is preferred.

Industry

Industrial development and use along any river valley must be restricted if that river is being managed primarily for recreation benefits. The water must be kept clean, the volume of flow must be optimized, the shoreland scenery should be unspoiled, and the landscape should be available for recreational use. Industrial contamination of the water occurs when any plant effluents are permitted to flow to a watercourse. These effluents may be domestic sewage, chemical or petroleum byproduct wastes or surface runoff from a plant site. All should be contained in holding basins and settling ponds so they cannot flow unchecked and untreated into the stream. Water also loses its recreational quality if it is silt choked. Industrial situation is induced when surface disturbances take place. Some examples of these are gravel mining and washing, pipeline construction across stream channels, tree removal for exploration access, drilling sites, roads and plant construction and also from channel modification. The recreation alternative does not prohibit any of these practices along the Little Red Deer, but requires that they be kept in perspective, with recreational functions dictating the constraints on industry so that water quality may be protected and somewhat improved.

Flow levels in the river are mainly a response to climatic events, but industrial society is able to regulate those flows even on the largest of rivers. On smaller streams, where the flow is very meagre at times, water dependent industries tend to guarantee their water supply by damming the channel to hold back the peak flows. In other situations, a low weir may be used to simply raise the water level at the point where a pump is to be operated. This makes possible the most efficient withdrawal of what little flow there is in the stream. Two such weirs have been installed in the Little Red although both serve an established need, they have three downstream effects which reduce recreational quality. Total water in the river is reduced and is more stagnant; fish have a poorer quality and lower volume of water and they cannot swim over the weirs; and thirdly these weirs obstruct the channel for canoe and kayak paddlers. The only practical alternatives here are: provide offstream storage which requires withdrawals from the river during peak flow only and removes the need for weirs during low flow, operate all pumping operations from deep pools in the channel rather than from weirs; and lastly, require all industrial installations in the channel to provide benefits which are primarily recreational in character.

Shoreland scenery is impaired for recreation if intensive industrial activity or installations occur in close proximity to the watercourse. This must not be permitted in any of the major recreation nodes, nor should it be permitted at most other valley locations. But certain exceptions must be made since some prime resources are available only at shoreland sites. Examples are gravel pits. As important as excluding these uses is the need to adequately regulate approved operations. Landscape planning, regular maintenance, grooming and progressive reclamation are essential so that industry may proceed but amenity values will not be victimized. Shorelands are principally recreational features, especially when using the recreation alternative, and so all high impact consumptive or conflicting uses should be directed elsewhere under most circumstances.

Land Ownership

Shorelands should remain in private ownership. Public domain must be adequately protected but backshore areas will not necessarily be better managed if turned over to the public sector. Public ownership of the prime recreation nodes is probably desireable though. Present owners wish to retain them because they offer some productive capability from which revenue can be realized. A large measure of their advantage also relates to riparian rights. Both of these would be reduced by this alternative. Yet the potential to realize comparable benefits from recreational use is quite low, and would fail to motivate land owners into that type of use.[28] Then too, rural land owners are very apprehensive about having public recreation occurring on their land, or even on neighbouring land. They lack confidence in the reliability and responsibility of the public toward private property. This discourages them from wanting any form of recreational activity other than seasonal use cottage subdivisions, where through direct sale of land, revenues tend to be sufficient to compensate for the intrusion of more people.

But there is a need to develop additional facilities for recreation. Some of these facilities should be extensive and diversified to accommodate a range of interests and enhance the user's experience. The public sector is probably best equipped to assemble the necessary land and provide the funds and experience needed to develop these areas. The support of rural residents will be required for these ventures, and this will not be readily forthcoming until assurances are proffered demonstrating that the facility for recreation, and its use will not create hardships for area land owners. These assurances will not be possible without strict and enforced regulations, continuous on site custodians and facilities capable of offering more than accommodation.

Finally, it is understood that watercourses are public domain. The limits of this are not adequately understood by the public recreator nor by the local rural land owner. Since this recreation alternative will increase the numbers of nonresident users to the valley, the limits of ownership must be understood so that the low investment public does not create hardship for the high investment rural shoreland resident. The converse to this also must be stated. The public domain is best defined as the water in the stream channel and all bed and banklands extending to the bankfull level of the shorelands. Beyond that level, shorelands belong to the owner of the land traversed by the stream.

The Green Area

The recreation alternative enhances opportunities for recreation activities in the Green Area by permitting the development of facilities for recreation. It also gives preferential consideration to recreation when various options are considered. Industrial and commercial exploitation are not prohibited, however. It is a use orientated plan that gives recreation the primary emphasis. In so doing, certain other possibilities have to be abandoned.

Recreation activities are available at sites with superior amenities and where access is available or may be provided somewhat readily, and where fragility is low. A variety of facilities may be developed at these sites, depending on specific site advantages. Examples of these possibilities include campgrounds, recreation vehicle parks, integrated recreation areas or parks, youth hostels, private or commercial lodges, institutional camps, and outfitters' base camps. Many specific possibilities have already been presented in the Generalized Potential Section of this report. Since the Green Area is a designated non-settlement region and largely Crown owned, most facilities developed there should be intended for public use, although they may be privately operated. Even though recreation is the preferred use, the most appropriate type of facility is the basic campground and the activities promoted should be essentially passive rather than intensive.

Off-road vehicles should be discouraged except at confined areas of high impact absorbing capacity and away from shorelands, wildlife and facilities used by all other forms of recreators. A partial concession may be granted to snowmobiling provided their routes are confined to the frozen surface of the watercourses where wildlife and vegetation will not be threatened and when other recreators are relatively scarce.

Access into remote areas should be restricted to non-vehicular means as much as possible. Without the presence or use of machines, more people are able to enjoy a small area without competition, they consume more time, penetrate less wildland and leave less impact. Without engines, the distance covered is not so meaningful as the opportunity to participate in nature and the activity.

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[28] A research report on camping and campgrounds in Alberta, carried out in 1975 demonstrates that most campgrounds in the province are publicly owned and offer services at no charge. Private campgrounds frequently do not succeed while charging a user fee.

While this management alternative favours recreation, it is not expected to greatly restrict the pursuit of economic activities. Apart from fencing needed to prevent cows entering developed recreation areas, there would be no need to alter the present livestock grazing practices. Where deeded lands are cultivated in the Green Area, that may continue, however, increased clearing for agricultural purposes is discouraged. Timber harvesting is acceptable on most Crown forests although cutting blocks should be located and designed in cognizance of recreational priorities, and haul roads should be laid out to accommodate future recreational access. Oil and gas activities are already quite stringently regulated. However, if this alternative is accepted, the most significant further requirement would be road planning to facilitate recreational use. Also, in the interest of recreation users, it would be appropriate to restrict industrial traffic from operating on public roadways on week-ends (Friday 20:00 hours to Sunday 24:00 hours), between June 1 and September 15.

The final issue of relevance to recreational use in the Green Area has to do with private cottage development. Although settlement is excluded from the Area, seasonal use cottageing is, to some extent, tolerated. The overriding issue tends to be one of maintaining a guaranteed seasonal use after the expense of constructing the cottage is assumed, and roads, electrical power and heating units are all available. The recently published policy manual for this area states that "residential development will be allowed on a very limited basis, as required" in the Multiple Use Zone.[29] This same report permits residential development in the General Recreation Zone. Cottages are not specifically referred to, but it seems as though some allowances exist in the two zones referred to, as well as in the Facility Zone. It is uncertain how much interest exists for cottage subdivision in areas away from lake shores. However, the existing subdivisions along the Little Red near Water Valley and along the Red Deer River at Coalcamp and Garrington, demonstrate a demand is being presented. Other seasonal home subdivision proposals are being drawn up regularly.

Until the present time, it has been a fairly firm policy of Planning Commissions, Provincial Planning Board and Provincial Government agencies to disallow cottage subdivision in the Green Area. Refusals are usually based on arguments such as:

- private privilege should not be provided on public land,
- residential development increases the potential for forest fires in the surrounding forest,
- occupants of seasonal residences object to commercial timber harvesting in surrounding forest,
- both occupants of cottages and their dogs harass wild animals in the vicinity,
- excessive fishing pressure is placed on stream fish populations,
- residents demand road maintenance, snow removal, fire protection and police surveillance,
- site characteristics are not appropriate due to slope, cover, or soil stability,
- water will become contaminated,
- the subdivision will eventually have year round occupancy.

No criticism is intended toward any of these issues, but there may be sufficient latitude available so that most of these points could be equally applied to any recreational facility in this area. If preference is given to the recreation alternative, it would be consistent to relax these objections which relate largely to recreational users being accommodated. But it is not desireable to tolerate the gradual conversion of summer use facilities to full-time use facilities because they require more costly servicing and have a heavier impact on the site. Land made available for recreational development should be leased rather than sold.

Finally, irrespective of the use carried out in the Green Area under this alternative, much attention needs to be given to minimizing negative impacts on wildlife, opportunities to view or hunt them, and sport fish. Each of these offer a recognized recreational experience. As much as seems feasible, efforts should be made to protect conditions essential for wildlife and fish and even to enhance them.

IMPLICATIONS OF THE AGRICULTURE ALTERNATIVE

The agriculture alternative is quite similar to the conservation alternative. The Alternatives for Land Use Matrix shows both having very few unrestricted development opportunities except for basic camping. The most conspicuous difference between these two alternatives is the opportunity to develop the valley's high potential recreation resources under the agriculture alternative whereas these areas are only available for low density use and as wildlife habitat if conservation is preferred. The other similarity is the availability of most shorelands for livestock grazing in either instance. Even though many types of intensive use developments can be accommodated in this alternative, each requires a development permit. As has been stated earlier, these permits will usually not be available if the site has good agricultural capability or is currently being used to the extent of its agricultural potential. They should be granted for existing recreation facilities and also at sites with superior recreational attributes where agriculture will not be unduly inconvenienced.

Conservation

The application of the Streamway Corridor and the Streamway Influence Belt insure the preservation of the immediate stream banks and the careful monitoring of activities along the critical backshore areas. Even agricultural practices are constrained by these zones. Several units and parts of units are not available for development uses. Units A-1, E-1, H-2, K-1, K-4, L-1 and N-2 are in this category. Portions of several other units are given similar protection. All of these areas are largely natural and have sensitive or fragile characteristics. They are therefore best suited for perpetuating natural hydro-ecological conditions. These areas are available for livestock grazing and also for most recreational pursuits that do not require facilities or vehicular access. Trail riding, hiking, ski touring and canoeing are acceptable uses but trail bikes, snowmobiles and other motorized vehicles are excluded. Conservation is also extended to the numerous Passive Recreation areas. In these areas, even though grazing is permitted and both cultivation and unserviced camping are conditional uses, developed facilities of the intensity and variety accepted in either the recreation or multiple use alternatives is not permitted. Along much of the valley agricultural use is considered the best choice of land use and the most realistic guarantee of protection for ecological as well as rural amenities. While providing this protection, agriculture functions as a rewarding economic pursuit.

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[29] Alberta Energy and Natural Resources, A Policy for Resource Management of the Eastern Slopes, Edmonton, Alberta, July 1977, p.10.

Recreation

Apart from basic campground facilities, which are amply permitted, recreation development is nearly as tightly restricted by the agricultural alternative as by conservation. Semi-serviced and serviced campgrounds, institutional or commercial recreation facilities and cottages all require special development permits even on the areas designated for active recreation. These permits are not entirely dependent on recreational capability either, but are also subject to the agricultural potentials of the site. However, if the site has sufficient recreational characteristics and its agricultural merits are relatively low, any of these facilities are valid. Total recreation development capability and preferred locations are very much the same as listed for Conservation. The three principle nodes would be based on existing facilities but expanded in total size and capacity so that future needs can be adequately handled and diversity of activities may be enjoyed. One of the most urgent requirements of these recreation nodes is to minimize the spillover onto neighboring private lands. Roads to the facilities should be of adequate design to minimize dust and danger, irresponsible conduct must be suppressed, local agricultural traffic must not be unduly inconvenienced (such as grain hauling or cattle and machinery movement), and private property and rural residents should be spared nuisance traffic, trespass violations, livestock harassment, or property risks. 30

Several solutions to this can be proposed but all of them will meet with opposition because someone will be inconvenienced by each. However, this writer is persuaded that:

- rivers and their streamways should remain public domain,
- the public should have an opportunity to recreate on public domain offering favourable amenities and not previously committed to an alternative function.
- facilities for recreation should be adequate so that users may engage in activities that are enhanced by the site characteristics rather than simply being confined to a campground lot where activities are restricted by space and disturb neighboring recreators,
- facilities for recreation should be developed to accommodate those demands which relate to the local resource base,
- new or expanded facilities for public recreation should not cause undue disruption to the surrounding rural experience,
- minimum standards of management should be required in all developed recreation areas,
- trespass violations should be adequately policed and prosecuted without excess onus being placed on the rural property owner,
- rural property owners should be freed from being subject to liability claims laid by unauthorized occupants or users of his property regardless of the potential for harm that may occur. His liability should only apply to people with authorized access privileges,
- the definition of trespass should be free of any requirement to post private property.

The three recreation development nodes are Silver Lagoon to Red Lodge, Westward Ho to the Nazarene Church camp, and from Silver Creek to the North Water Valley - Camp Valaqua area. Unserviced campgrounds will again be preferred at all three areas but some serviced facilities are recommended. Capacities for the three areas are: 240 basic and 80 serviced lots in the Red Lodge - Silver Lagoon area; 120 basic and 80 serviced lots in the Westward Ho area; and 280 basic and 80 serviced lots in the Water Valley area. Both the Westward Ho and Water Valley areas also have conditions suitable for seasonal use cottage subdivision. However this use is conditional on a development permit which will not be available if the agricultural potential is significant. Besides these three nodes, some recreational use potential is evident in other areas. There is not sufficient need for development of those areas at the present time, but agricultural activities in them should be restricted so their natural characteristics are largely protected.

All existing church camps may continue to operate and develop on their respective sites. Additional sites suitable for comparable development are present, all of them designated as active recreation and some of them outside of the three nodes already discussed. Church camps and commercial accommodation developments are conditional uses.

Along the streamway most non-motorized forms of recreation are permissible. The use of off-road vehicles, other than snowmobile is not appropriate. Snowmobiles should not be operated off of snow covered ice on the river except where access or egress is needed at trail terminals. Any unauthorized use of off-road vehicles (or standard highway vehicles) over private property should be subject to vehicle seizure by either a law enforcement officer or the land owner.

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30. Most of the inconveniences listed here are best described as irresponsible conduct. Some are legal offenses, such as trespass or disturbing the peace. All of them are aggravated by increasing the density of people. Public recreation facilities attract people so they may engage in activities of a rather frivolous nature. Sometimes these activities are exaggerated to the level of irresponsible conduct whereby the recreation facility and its surroundings are missused. For this reason, rural residents view neighboring recreation areas with mistrust and apprehension.

Even though private land owners, including farmers, require a development permit from Council to develop recreation facilities in the Streamway Influence Belt, there is sufficient reason for him to pursue that option. There are many amenities in the river valley which attract recreational users, and since the streamway itself is public domain, a much needed service could be provided on shorelands either with or without cost to the user. For example, a farmer may develop a trail system along the river valley through his farm, connected to extensions developed on neighboring farms, and then promote their use. Control could be largely guaranteed by restricting use privileges to members of specific riding clubs, snowmobile associations, cross-country ski clubs or nature societies. Other guests could also be accommodated. In this way controlled benefits are provided for the public while scenic shorelands are retained in private ownership. Policing of these facilities would be done by the participating clubs or their privileges would be cancelled. Similar procedures could be used for privately developed recreation vehicle parks or campgrounds.

Industry

The oil and gas and the gravel mining industries both impinge on fertile soils. However, both are available only where the resource may happen to be located, and frequently they are overlaid with productive soil. In other instances these resources are found underlying sensitive or unique features such as highly erodable materials, high capability habitat or high amenity landscapes. Each of these are concerns that pose conflicts because of the inflexibility of location for these industrial operations. When considering the agriculture alternative the foremost consideration is the conflict with agricultural activities and the impact on agricultural capability.

In order to minimize soil disturbances, development sites must be kept to a minimum size, and as much disturbed land as possible must be reclaimed to a productivity standard equal to the pre-disturbance condition. Pipelines should be grouped in corridors and their routes selected through impact resistant areas. Gravel pits must be reclaimed to the extent that the reclaimed surface has a productivity capability equal to adjacent or similar type areas which have not been mined. This can be accomplished by carefully storing topsoil, recontouring the pit site and returning the topsoil. Cleaning, crushing and storing of aggregates must also take place on a confined area from which top soil has been salvaged. Wellsites, flare pits, storage batteries and processing plants occupy valuable surface space. Sometimes the space so occupied has agricultural value, sometimes the space is rich in intangible values. To the extent that any of the installations are locationally flexible without excess cost, they should be developed beyond the Streamway Influence Belt. Therefore, productive agricultural resources should be kept free of space occupying industry. Sites with soil ratings of Classes 1, 2 or 3 on the Canada Land Inventory scale should be unavailable for industry. Where industry is not locationally flexible and the selected site has good soils, one of the requirement for developing the site must be the stripping away of the topsoil. This soil must be retained for eventual reclamation of the site or for the reclamation of other disturbed land surfaces.

Any land use likely to cause a high impact on shorelands that have agricultural capability is undesireable from an ecological point of view, particularly if that impact is greater than would be caused by the agricultural use. If a site lacks unique or fragile features, then the non-agricultural (particularly industrial) use needing that location is only undesireable from the standpoint of agriculture. Its approval or rejection must be decided according to the impact it will have on agriculture and the locational alternatives. It must be re-emphasized that shorelands are available for industrial purposes only if other locations cannot serve the necessary function. The Streamway Influence Belt is the critical area in this respect.

Shorelands are available for industrial purposes only if other locations cannot serve the necessary function.

Industrial activities which have some degree of impact on the watercourse are regulated by legislation, but the integrity of the streamway, clean water, reliable flow, and minimal impact on the environmental attributes of the valley are essential. Weirs, dams, diversions or pumping systems need not be rejected or planned on the basis of maintaining a recreation stream nor even a scenic river, but basic ecological functioning must not be sacrificed. This means that fish habitat must be protected, the water must be unpolluted and normal flow must not be altered beyond the extent where either is threatened.

Agriculture

Overall, livestock grazing is considered a low impact use by this alternative. It is accepted as a permissible use under nearly all circumstances. It is understood that cattle and wild game, although not compatible, will co-occupy shoreland grazing resources.

Wildlife areas may be protected from high impact developments but will not be shielded from competition with domestic livestock except in the Streamway Corridor. Agriculture will be constrained by the need to maintain the river's natural geohydraulic processes and its stream dependent biological communities. Flood prone areas, rapidly eroding valley sides and nesting areas for waterfowl or endangered species must be kept free from agricultural encroachment. All sites fitting this description are shown on the Generalized Potential Map as Preservation areas.

Clearing land for agricultural cultivation is permitted at locations designated as agricultural on the Generalized Potential Map. Wherever topography and soils are suitable for agriculture in these areas it may be pursued. Again, however, the Streamway Corridor in an exception. Also, because of their potential impact on the watercourse both clearing and new cultivation in the Streamway Influence Belt require a special development permit from the relevant municipal authority.

Valley flats having conditions suitable for either passive or active recreation, but which are currently under cultivation should be maintained in crop production. Other locations with similar contrasting potentials but not now cultivated should generally be available for crop production, but a permit is required before proceeding to clear or break the lands involved. Only when a recreation function exists or where a site is highly preferred for recreational use would the right to pursue the agricultural capability be denied. In spite of all these concessions for agriculture, if an existing or potential agricultural use is damaging the geo-hydraulic functioning of the stream or its ecological system, then that use must be corrected or else disallowed.

To some extent or in some locations shorelands are regularly flooded by water from the river. At other locations erosion is progressively removing the river bank and reducing the useable shoreland areas. The area affected may be under cultivation, used as grazing range or even as a building site. In most of these cases no stream manipulating works are recommended because erosion is a recognized natural river process, but its rate is often accelerated because of indiscreet shoreland management. In these situations corrective shoreland management is preferred over streambank or streamway works. However, where high cost or semi-permanent structures are being threatened by either flood or erosion, the necessary dyking, revetments or armoring should be installed.

Livestock confinement is not an appropriate shoreland use even if the agricultural alternative is preferred. This is because all of the management alternatives confer first order consideration to the stream, its processes and its functioning rather than to the shoreland or to the streamside land use, no matter what that use is. Therefore, the first requirement of the agricultural alternative is to insure the high quality functioning of the Little Red Deer River, not to maximize agricultural benefits. All feedlots, pig barns, dairy operations and even winter feeding areas for livestock should be set back from the stream's shoreline and beyond its floodplain. The distance required must be sufficient so that animal wastes will not drain into or be washed into the watercourse. The minimum standards acceptable for this operation are presented in the Management Standards section of this report.

The last issue needing discussion here is agricultural chemicals. The greatest impact of these chemicals is in the water systems. Excess, unconsumed, and incompletely degraded agricultural chemicals either remain in the soil, are filtered downward into groundwater supplies, or they are carried overland by surface runoff. Some of these chemicals accelerate the growth of algae which deprive water of oxygen resulting in stench and fish kill. Some directly poison aquatic life; pesticides and herbicides are example. Others contaminate the water with chemicals which are cumulative and eventually cause death to the aquatic species or to those life forms which consume the aquatic species. For these reasons it is strongly recommended that no agricultural chemicals be used to treat land, seed or crops in or used in the Streamway Influence Belt.

Overall therefore, this alternative gives preferential consideration to agriculture over all other considerations, but the requirements of the streamway itself are first met.

Land Ownership

No major shifts in ownership are recommended. The bulk of the shorelands should remain in private title except for the public domain corridor along the stream itself. Ownership allows individuals the rights of title including riparian rights and authority to manage for personal benefit. Since shorelands are prized recreation areas more incentive should be provided to motivate and assist private development and maintenance of the shoreland for public use.

Public ownership of major recreation complexes is desireable. Either Red Lodge Park should be expanded or the adjacent area should be developed for recreation through other agencies. Although non-agricultural ownership of lands is not opposed by this alternative there should be no subdivision and sale of land capable of agricultural productivity for the purpose of residential, recreational or industrial use.

As was mentioned earlier, there can be no questioning that the river, its bed and its banks are public domain. Adjacent property owners have several privileges as a result of the river's presence, they also have specific responsibilities. The public too have privileges because the river is Crown owned, but their responsibilities are also clear; they may use public land but also must respect the rightful property of others.

The Green Area

In the Green Area, lands are not available for settlement. Many well established farms or ranches are located there however, and no suggestion is made here to change that situation. No additional lands are being released by the Crown for settlement purposes though. And in the Forest Reserve, nearly all lands are Crown Owned and no private tenure exists, at least not for agricultural purposes. Outside of the Forest Reserve, a large amount of Crown Land is leased by neighbouring ranch owners to supplement their grazing range. Some of those lease lands have been cleared, cultivated and seeded to hay or grain crops.

The agriculture alternative makes livestock grazing a permissive use throughout the Green Area. Only the constraints of the Streamway Corridor are imposed. It is also desireable to impose some constraints on the important wildlife winter ranges (particularly in Unit S-1). Cultivation is permitted on deeded lands and clearing of potentially arable privately owned lands is a conditional use. Both cultivation and clearing are conditional on Crown lease lands, but neither are acceptable in the Forest Reserve.

Timber harvesting is permitted throughout the region but is regulated by the Forests Act and the Timber Management Planning and Harvesting operating Ground Rules. In the case of a Forest Management Agreement, an Order in Council states the terms for managing the forest resources. The primary considerations in each timber harvesting agreement are the short term maintenance of the watershed and long term sustained yield of timber. None of the areas in the Little Red Deer basin are so unique or fragile that Timber harvesting is prohibited, but some locations are pristine, possessing high amenity values or have sensitive soils (Units O-1, Q-2, R-1 and R-2). Harvesting in those units should be scheduled to minimize esthetic and ecological disturbance.

Oil and gas activity is permitted according to existing regulations, but with the proviso that access roads be as functional as possible for both timber operations and the oil and gas industry.

Recreation is appropriate on most forested lands, and particularly so along the watercourse shorelands. However, the forms of and provisions for recreation should be the same as already discussed for the conservation alternative.

IMPLICATIONS OF THE MULTIPLE USE ALTERNATIVE

Multiple use of this river valley involves a combination of the three previously described options. There is a definite and strong emphasis here on preserving water quality as well as sensitive shorelands. Opportunities for recreational development are quite liberal and uses which conflict with recreational uses or recreation facilities are excluded from areas where recreation potentials are high. Opportunities for grazing livestock are fairly generous and soil cultivation is permitted on both valley flats or sides if those areas are not considered locally sensitive or best suited for other functions. Soil cultivation is conditionally acceptable even on passive recreation areas, subject to the pressure for recreational use of that area. Developed sites for industry, recreation, residences or commercial services are not excluded, but regarded as conditional uses and therefore require development permits.

Conservation

Several units and parts of units are not available for resource use or facility development. All of the valley floor and side areas in Units A-1, E-1, H-2, K-1, K-4, L-1 and N-2 are in this category. These areas are primarily reserved for the perpetuation and restoration of natural hydro-ecological processes and such recreational pursuits as require neither facilities or vehicular access. These shorelands are available for livestock grazing but on a conditional basis only. That is, they may be grazed until it is evident that natural conditions begin to deteriorate. Thereafter, grazing must be either reduced or stopped. Damages include destruction of regenerating trees, loss of forage and browse required by wild ungulates, and contamination of the water. The Streamway Corridor restricts livestock access to the watercourse for drinking and also requires that they be prevented from trampling or browsing along the immediate banks of the river. In addition to the units listed above, several portions of other units require the same protective measures.

Several areas along the river valley should not be available for resource use or facility development.

Recreation

Most recreational pursuits may be accommodated to some extent along the valley when the multiple use concept is considered. Shoreland conditions required for each facility differ substantially and so the facilities need to be appropriately directed. No existing development will have to be discontinued, nor will drastic changes or improvements be called for. There is capability along the Study Area for a considerable increase in recreational installations, especially basic campgrounds. Examples of sites suitable for these include Units A-2, B-1, B-2, C-2, G-1, M-1, M-2 and N-1. The total development capacity of these areas is approximately 2400 basic lots. This amounts to six times the present capacity of installed facilities. In addition to these, there are conditions suitable for more intensive recreational development at several locations. These sites can accommodate either serviced campgrounds or else institutional, commercial or seasonal residential facilities. If all were developed for serviced camping approximately 1000 lots could be provided. However, all existing cottage subdivisions should remain and conditions in the areas designated for active Recreation in Units M-1, M-2 and N-1 are better for seasonal residences than for camping. Only one area is considered at all acceptable for country residential development, that is the upland area south of the river break and north of Highway 27 in H-Run. The Silver Lagoon subdivision, although not favourably rated would not be altered. Considerable potential for trail system development and use and snowmobiling is also present. To some extent, as with the other alternatives, high flow events provide some canoeing potential.

Even though potentials for recreation are present all along the river, activity and development should be confined as much as possible to nodes where short term demands can be adequately satisfied and where adjacent land owners will be least inconvenienced. Two principle nodes are C-Run and H-Run. Secondary nodes would focus on L and M Runs jointly and thereafter on A-Run.

Agriculture

Most lands along the Little Red Deer River shown to have agricultural suitability on Map 15 would be available for those agricultural pursuits considered appropriate by the land owners. The only exceptions to this generalization are lands within the Streamway Corridor. Also, although existing agricultural practices may continue and clearing is listed as a permissive use on these lands, any major shifts in land use in the Streamway Influence Belt require a development permit. In most respects this alternative provides the same degree of agricultural use as provided under the agriculture alternative. The main difference is more opportunities for recreation are provided under the multiple use option. Feedlots continue to be a conditional use. They are not desireable in the Streamway Influence Belt under any of the alternatives and so no relaxation of this stand is encouraged even here. There is no objection to them beyond that controlled area but they should be required to meet minimum standards before being developed.

The main concern, and source of pollution to the Little Red Deer River is agriculture, and more specifically livestock effluents. The Little Red Deer River is not considered the most serious example of this but, as the river under study now, it is an example with serious enough contamination to warrant action to progressively correct the problem. Implimentation of the Streamway Corridor is suggested as a minimum measure for correcting this problem. As a suggested incentive for cattle operators to correct problem causing activities, and in recognition of the historical precedents of stream accessibility, it would be desireable to develop a cost sharing agreement whereby the Provincial Government will subsidize the farmer for either erecting fences as required, or providing offstream watering facilities or both. A sequence of suggested follow-up steps are:

- eliminate in-stream watering of livestock
- eliminate on ice feeding of livestock
- allow no expansion of holding and feeding facilities within the Streamway Influence Belt without a development permit.
- require all revisions to offending operations to be designed and located according to the guidelines presented in this report.
- phase out all offensive operations over a reasonable period of time.
- require all livestock confinement facilities to be located beyond the Streamway Influence Belt.

There are at least four feedlots or holding facilities for livestock which are badly located along the river. Others are marginal. Unless the effluents from the livestock held on these premises is collected and allowed to decompose prior to entering the watercourse it will contaminate the water.

Development

The requirements for industry and industrial infrastructure are not significantly relaxed irrespective of the management alternative selected. Sites suitable for intensive site development are shown on the Percent of Mean Matrix but even where those scores are high they have not been transferred to the Generalized Potential Map. This is because site developments for either industrial or commercial purposes depend on several factors besides the site specific physical conditions. However, as can be seen from the matrix at least seven units score very high for development and quite low for amenity categories. These are preferred units for concentrated development. Still all of these units are not considered potential industrial sites. The Westward Ho hamlet and campground and the Seventh Day Adventist Church camp are examples. Both are suitable for expansion away from the river. The Canadian Superior Gas Plant between Harmattan and Elkton is away from the river and is not considered a problem. If expansion is necessary the only consideration would be land consumption.

The major developments which require consideration are those directly affecting the watercourse: pipeline crossings, weirs, pumping installations, gravel pits, and dams. Although all of these are part of a multiple use river valley, all affect the stream's capacity to function well. A standard of performance for the rivers must be accepted, and thereafter, no work should be done that will change or diminish the flow, condition, course, current or cross-section of the river beyond that standard. Where the multiple use alternative is preferred, it is understood that the standard would be more lax than if conservation were preferred.

Land Ownership

The greatest portion of the shorelands should remain in private ownership. Certainly controls are needed to guarantee the protection of the public domain but it is preferable that these controls be applied to deeded land rather than bringing the controlled areas under public ownership. This allows individuals the privilege of title, riparian rights, and the authority to manage. If ownership rights are removed by sale, he loses all authority including riparian rights.

Public ownership is desireable for major recreation complexes. These should be recognized as single use areas available for public use. As such the Crown should acquire the land and assume responsibility for their development. Privately owned and developed facilities for recreation are also desireable, but they must conform to the site conditions and guidelines presented in this report. As was mentioned earlier, there can be no questioning that the river, its bed and its banks are public domain. Adjacent property owners have several privileges as a result of the river's presence, they also have specific responsibilities. The public too have privileges because the river is Crown owned, but their responsibilities are equally clear; enjoy and use but don't abuse what is owned jointly with all Albertans, but also respect and don't use what is owned exclusively by another.

The Green Area

In the Green Area, the multiple use alternative combines the objectives of the previous aternatives. Most of the recreational benefits available and the facilities appropriate for their enjoyment are acceptable as discussed above. However, preferential consideration would not be given to recreation as is the case with the recreation alternative. Rather, a compatible blend of various uses must be worked out with alternate uses weighted equally to recreation. Overall, this alternative envisions a number of mainly single use areas based on a common and mutually advantageous infrastructure. Over time, there may be a shifting from one primary function to another and back again. Tree harvesting may be followed by habitat maintenance and thereafter, the area may revert again to timber production. Areas where oil and gas activity is quite intense can also have timber operations underway and when the petroleum is exhausted, roads and clearings may be maintained for recreation access. In most instances however, prime recreation areas must be identified and shielded from conflicting uses. Winter ranges cannot be destroyed and re-established, and good quality streams must not be allowed to deteriorate. In order for multiple use to succeed therefore, it is necessary to plan a compromise which allows a fair measure of resource exploitation while insuring the availability of intangible types of use. This means that certain public use facilities must be foregone because of the requirements or priority of conflicting intensive industrial activity nearby. Elsewhere some industrial resources cannot be exploited to the extent of their potential because of the high negative impact such action would inflict on adjacent recreation or ecological values. Overall, conflicts must be resolved according to the principles of the Eastern Slopes Policy, wherein the importance of watershed, wildlife and recreation are clearly reinforced. Where conflicts would be produced by introducing a particular activity or development, then the established use should usually be preferred. Crop and livestock production will continue on much the same basis as in the past. Clearing for increased cultivation is permitted on deeded lands where arable soils and conducive topographic and climatic conditions prevail but no expanded cultivation or agricultural clearing should be permitted on leased Crown lands.

No additional residential development is desireable although the potential for seasonal use cottage development is the same as expressed under the recreation alternative. The multiple use alternative allows a great deal of consideration for timber operations, wildlife management and livestock grazing so more objections to these cottages must be recognized.

Again, off-road vehicles must be carefully regulated. Their operation must be confined to designated areas where wildlife, seclusion, and fragility are not characteristic features and where solitude and quiet are not the primary aspiration of users. Snowmobile travel is generally acceptable on the frozen river surfaces but should be restricted from regenerating tree harvest areas, winter ranges used by wildlife and those cutlines which extend out from winter ranges.

More roads will be needed to accommodate traffic generated by the various activities accepted in this alternative. But no roads should be constructed simply to make remote areas accessible.

Appendix `C´

AGRICULTURAL USE OF SHORELANDS

APPENDIX C

AGRICULTURAL USE OF SHORELANDS

HISTORICAL OVERVIEW

History presents a bulk of evidence that the use of shorelands, and in particular river shorelands for crop production is not a recent innovation. Earliest civilizations grew up along the fertile banks of rivers such as the Yellow River in China, the Nile in Egypt, and the Euphrates in what is referred to as Mesopotamia. Nutrient rich silts deposited along these river's floodplains were the vital component of fertile and productive soils. Here even primitive societies were able to grow food crops in abundance and so, be freed from the unpredictable uncertainties of life common to migrant cultures. By not having to constantly wander in search of food, these sedentary agrarian societies were able to devote their time and efforts to social, cultural, industrial and military interests. As a result, higher and higher levels of civilization evolved and living standards improved.

Even today, many of the most productive crop producing areas are river shorelands. What developed through history has continued into the present and is almost accepted as an undisputed practice especially by the farm operators. So today we have floodplains, deltas and terraces cleared of their tree cover and cultivated to crops. With few exceptions high yields and consistent crops are produced on these locations. Where volume of production is equated with the living standard of the operator, the zeal to exploit these shoreland soils is understandable.

Even apart from clearing and cultivation, river shorelands are considered a valuable asset to the farmer, because of their forage productivity, the shelter they supply and the reliable supply of fresh water that is available for livestock. Cattle are readily able to traverse the otherwise difficult valley-side slopes, graze under the tree canopy and browse the understory saplings. During hot summer days livestock benefit from available shade, and when winter's cold is accentuated by a severe wind chill, trees lend shelter that would otherwise need to be provided in sheds. Winter or summer, the opportunity to water livestock directly in the river is a convenience that is by far preferable to damming a gully, digging a dugout or drilling a well. Even winter feeding, when done in the valley or on the ice, allows the benefit of shelter from the winds and the convenience of servicing the watering hole without need for either the cattleman or the cattle moving to another location. Finally, much of the winter's accumulation of wastes is flushed away as the ice and snow melts.

Where history has justified the use of arable river shorelands for crop and livestock production, history must also be referred to when problems related to these uses are discussed. As civilizations were primitive, mankind and animal co-existed in a state of mutual respect, often residing in similar shelters and hunting the same areas. As man improved his station and became more sedentary and agrarian, he no longer inhabited the extensive uplands or the dense forests, preferring rather to venture there only for the opportunity of slaughtering wildlife to augment the meat supply he otherwise secured from his domestic herd. While no massive transportation and marketing system was available for farm produce, the river shorelands almost alone experienced development pressures. Later as market systems developed rivers provided the most economical means of transportation.

As North America was settled by European emmigrants, river shorelands again became the focus of settlement. The St. Lawrence and Red River settlements are early examples. Again, the uplands and forests remained as habitat for wildlife. As development progressed however, and as populations grew and as agriculture continued to be the dominant industry, and as agricultural machines were refined, and as agricultural crops were improved, man's dependence on shorelands became less and less significant. As a result, he occupied the uplands, broke the prairie sod, cleared the forests, fenced the ranges and if he needed water he drilled a well or built a small dam or dugout. He travelled on roads, and the rivers became obstacles to movement. In this process, the extensive wildlife habitats of the bison, the prairie chicken, the pronghorn, and numerous other species was either eliminated or drastically reduced. And these forms of life, not being as adaptable as man and incapable of raising their standards of living as man had done, were forced to seek shelter and nourishment in the vestiges of remaining habitat. To a very large degree, in the vast agricultural areas of western Canada, these vestiges of wildlife habitat are now available only along river valleys and other non-cultivable terrain.

Even the earliest accounts of settlement in Central Alberta relate the recreational activities of the settlers. Not surprisingly river valley locations were sought out and used for recreational picnics or other outings. Red Lodge was early recognized as a favourite place for such events and so it was both developed and preserved for that purpose. As settlement intensified and cities grew the recreational demands multiplied. Pressures on places like Red Lodge now exceed their capacity and more recreational areas are required. River valleys, with their appropriate combination of water, local relief and forested slopes provide a strong natural lure for these people. Meanwhile, as most of these shorelands have been acquired by private agricultural operators the extent of clearing and cultivation is such that fewer amenity sites remain, and many that do remain are not available for public recreation. Most large areas of recreational appeal still remaining can only be found in the foothills region where neither private ownership or agriculture are common.

Some Comparisons

As an industrial society intensifies itself in an area, the impact it has on the ecological environment is progressively more pronounced. At the same time, the numbers of people who find employment, living accommodations, recreation space and an adequate supply of food increases. In fact, the productivity of the land, as well as factories has consistently increased while technology and population increased. These increases have been realized even while restraints have been introduced to reduce their negative impacts on the natural environment system. Today, more people are alive on the earth and consuming a higher per capita amount of goods than at any other time in history. Growth is therfore not in itself justification for abusive exploitation; to the contrary, it is justification for greater preservation.

Not many years ago, the timber industry was at liberty to clear the forests, denude the valley sides, skid and haul the timber along streambeds, float logs down the river to sawmills and move on to new areas without any concern for soil erosion, water contamination or reforestation. Today, the regulations restricting timber operators are numerous, and exacting, so as to maintain a perpetual forest but also to protect the sensitive shoreland watershed values and the quality of water in the streams. In Alberta, where regulations are more stringent than in many places, there is concern that the regulations may still afford too little protection, so a series of public hearings on the Environmental Effects of Timber Harvesting in Alberta is scheduled for 1978.[31]

Towns and cities have traditionally located on rivers or streams; so have industries. Water has been taken from the river for municipal and industrial supplies, while sewage and contaminated surface runoff and industrial wastes are fed back to the streams. Valley flats formed part of the urban development and escarpments were used as exclusive residential areas and wetlands or depressions were filled to allow development. Today development control and legislation requires sewage treatment, public shoreland reserves, and park dedication for high amenity features. Effluents of all types are monitored and maximum concentrations are specified to preserve water quality.

The oil and gas and the coal industry in Alberta have a reputation for doing whatever they please, particularly in the West Country. Seismic lines run almost everywhere vehicles have been forced through muskegs, streams and winter ranges. Roads, test holes and major excavations have disrupted overland flow of water, induced siltation of streams and concentrated noise and people to the extent that wildlife have fled or been destroyed. Perhaps worst of all, there were few requirements for restoring damaged areas or compensating for losses. But that is not the case any longer. The Coal Policy for Alberta restricts coal exploration and development largely according to environmental considerations. Legislation and regulations restrict the intensity and impact of those activities which are permitted by coal, oil and natural gas operators.[32]

Roads, dams, residences and reacreational facilities all have been traditionally developed in river valleys with little regard for the effects they had on the watercourse. Concern was rather, simply for the permanence of the installation. Today environmental impact is a chief concern.

All of the foregoing has been mentioned to emphasize the tightening of controls on all forms of land use and development. No industry has been singled out for special restrictions. Every known problem source is coming under review and constraint. Even automobile pollution control devices are standard equipment now and these affect all of us. The farmer too is experiencing regulations or restrictions of his liberties. Disposal of waste chemicals is regulated; suppression of weeds is required; development and placement of livestock confinement facilities is partially regulated; dairy operations must meet specified standards. These and other controls on the agricultural industry are no more exacting than controls imposed on other segments of the Alberta economy. Without exception these controls are designed to maintain or enhance the greater public good and are equally applicable whether private property or the public domain is the base for the operation.

The Public Domain

Rivers are part of the public domain. Beyond the stream and its bed this public domain extends to include the banks of the stream. The extent of this publicly owned bank is poorly defined, but is most generally understood to include all of the shoreland below the bank-full level of the stream. Although a landowner may have title to a legal unit which extends across the stream and along a considerable length of that stream, that land owner does not own the stream bed and banks or the water carried by it. He is however, entitled to privileges relating to the stream and these are know as riparian rights. These rights provide very positive privileges for the shoreland owner since many of his pursuits may be dependent on a reliable supply of fresh water. These privileges are not available to the farmer who owns land some distance from the stream. It is evident therefore, that the public watercourse provides unequal benefits.

As surely as riparian benefits are bequeathed, there are responsibilities imposed on a riparian land owner. Since a stream traverses his land, he has a right to expect the flow in that stream to be natural. That word, 'natural' applies equally to quality and to quantity. What is implied here is, since downstream riparian landowners are entitled to good quality water, then that water must not be contaminated by upstream riparian land owners. Furthermore, since the waterway is public domain, adjacent property owners are no more entitled to abuse that domain than they are entitled to abuse adjacent private property. For these reasons, private property owners whether they be grain farmers, cottage owners, industrialists or cattle ranchers must accept restraints which will ensure the health of the watercourse and respect the property which is public domain.

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[31] The Environment Council of Alberta (E.C.A.) is responsible for these hearings.

[32] See the Land Surface Conservation and Reclamation Act.

Problems Arising from Agricultural Uses on Shorelands

Agriculture along shorelands takes many forms. Each has its own operational requirements and its own impact on the area used. The response of others to those impacts is very largely determined by the personal prejeduces of individuals. Although this section singles out negative impacts, the intention is to avoid a prejudiced, single interest point of view.

Firstly, all agricultural activities cause some amount of surface disturbance. Some shorelands are extremely sensitive, others are unique and others provide highly critical breeding, nesting, feeding or migration sites for life forms which may not be valued by the landowner or may even be damaging to his enterprise. Even plant species may be considered among the unique or fragile components. The agricultural operation may seriously damage or destroy any of these. Clearing and cultivation would have especially high impacts.

Secondly, all shorelands provide a buffer strip to shield the watercourse from the impacts of events happening on land and also the buffer which absorbs the forces of floodwaters in the stream. Those shorelands which have developed naturally, in harmony with and in response to the perennial activities of nature are generally best equipped to sustain the natural vagaries in streamflow and shoreland activity. Where agriculture is pursued on these shorelands, the impact may be as minor as browsing the regenerating understory foliage and grazing the grass, or it may be as intensive as total tree removal and disruption of the soil binding root system. If this happens, the protective shield along the shoreline is either weakened or completely discarded. Thereafter shade is lost, erosion increases, siltation occurs, and pollutants are no longer filtered out of overland flow.

Thirdly, watercourses supply water, a vital component of life to humanity and wildlife. It is needed for drinking, washing, dilution and for recreation, but also serves as habitat for fish, waterfowl and water animals. For all of these functions, water must be acceptably free of contaminating substances. Agriculture, when pursued along shorelands, and in particular on the valley floor, is obviously in a situation where its maximum impact on the water will be felt. Livestock which drink directly from a stream will also release both urine and fecal wastes into the water. We acknowledge the inacceptability of human wastes entering streams, but livestock wastes are not only many times greater in volume but have more toxic constituents. Not only are animal wastes voided into the water, but the siltation is aggravated by the churning, and denuding effect of trampling the wet and poorly vegetated shorelands. Neither erosion of fertile soils nor sedimentation of fish spawning areas is desireable or even acceptable.

Further contamination of the water results from tree clearing and cultivation, which accelerate erosion. The use of agricultural chemicals; fertilizers, fungicides, herbicides, and insecticides indirectly causes eventual water contamination. The farther these activities are from the watercourse, the greater the amount of filtering and assimilation into the soil and the opportunity for breakdown of the chemicals themselves is greatly increased.

Finally, there is the livestock confinement operation. Everything said earlier concerning livestock is intensified when a confinement facility (feedlot) is developed adjacent to a watercourse. Even wintering, watering or feeding large numbers of cattle on the ice or close to the stream has a proportionate impact. Unless extremely high quality holding and treatment facilities are installed, these activities are responsible for massive inputs of manure to the stream. The accepted ratio is: 1 grown cow discharges as much urine as 10 adult humans. This figure is compounded when the higher concentrations of animal wastes is considered together with the fact that those wastes are untreated.

Problems Experienced By Shoreland Owners

It is not a one way street. Owning property adjacent to public domain is a liability too, especially when the public domain is a water course. Few ownership responsibilities are so carelessly assumed as are the public rights granted on Crown land. The public prefer to invest as little as possible into these lands while having exclusive privileges. Unfortunately, along watercourses, where the public backshore is very narrow, there is a tendency for the public to assume liberties that impinge on adjacent private land.

Since river valleys, particularly the more pronounced ones, have a concentration of recreational amenities; water, local relief and trees, there is a tendency for recreators to gravitate toward them. The more attractive locations tend to be developed with recreational facilities, particularly if access is convenient and the lands can be acquired. Two very unpopular and problem causing effects surface from this trend. First of all, these recreation facilities concentrate large numbers of people from distant areas into facilities for which they have no real sense of accountability and where crowding is encouraged simply to avoid developing more space. Both the crowding and the lack of accountability leads to excess, damages, dissatisfaction, overflows and trespass as well as high densities of traffic associated with visitor access. Also, users of these facilities are using leisure time, and many people consume excessive amounts of alcohol during leisure time, thereby aggravating their irresponsibility. When public recreation facilities are overcrowded with users from distant areas, and when many of those users' irresponsibility is intensified by drunkenness, the farmer who owns land nearby is threatened. His land, crops and property may be trespassed and damaged; the serenity of his rural environment may be disrupted, and his personal safety may be endangered.

River shoreland owners have at least three other types of problems. First of all they tend to be victims of off-road vehicle operators who refuse to restrict their activity to the river or to areas where they have permission to travel. Sometimes cattle are harassed, gates are left open or fences are cut. When machines fail, the neighboring farmers are called on for gas, for a lift, or for other types of aid.

Secondly, shoreland owners are subject to the irregularities of the river. These include flooding and erosion. Productive land or farm goods may be washed away or ruined by water. When this happens the farm operator incurs a loss.

Thirdly, farms bisected by a river are inconvenient to work with machinery. Normal rectangular fields with four straight sides are the most convenient type to cultivate. Rivers do not form straight lines but frequent curves and occasionally, small, unworkable peninsulas of good land are effectively isolated because of the river's tight loops. Then too, access to the land on the opposite side of the river requires roundabout trips to where bridges are located.

Appendix `D´

PUBLIC INVOLVEMENT

APPENDIX D

PUBLIC INVOLVEMENT

The public who reside along the shorelands of the Little Red Deer River, or those who reside elsewhere but own property on those shorelands were given opportunities to participate in the study. News releases, and other methods were used. The following pages depict or illustrate methods used.

THE MEDIA

Dear Sir:

The Red Deer Regional Planning Commission is presently conducting a river and river shorelands study on the Little Red Deer River. Public involvement in the study is an important component of the planning process.

One of the first steps in bringing about a public participation program is to generate public awareness of the nature and objectives of the project. To this end, a brief news release has been enclosed for your consideration as a possible article in your paper's next edition.

We appreciate your help in this regard.

Yours sincerely,

W. G. A. Shaw
Senior Associate Planner

Dear Sir:

May I bring to your attention a meeting that is upcoming and which I would like to see publicized in the paper. If you would carry this announcement immediately and again just before the meeting, our purposes will be best served. The notice should state the following:

> ELKTON
>
> LITTLE RED DEER RIVER PILOT STUDY
>
> The Elkton Community Centre will host a meeting between planners from the Red Deer Regional Planning Commission and the local public on Tuesday, October 12 at 8:00 P.M. Everyone having opinions on the future management of the Little Red Deer River and its adjacent land are encouraged to be present. A planning study is underway along this stream and the planners are hoping to give the interested public every possible opportunity to be involved and influence the results.

Yours sincerely,

S. R. White
Associate Planner

News Release

The Red Deer Regional Planning Commission is currently involved in a river and river shorelands study of the Little Red Deer River. This pilot project is one of five similar studies being conducted throughout the province this summer. Alberta Environment is funding the projects and providing coordination through a Task Force on Shorelands.

The objective of the Little Red Deer pilot is to devise a framework methodology to be used in future assessment of river shorelands. The result of such an assessment will be guidelines for management planning of river corridors. Such planning is necessary to avoid land use conflicts in areas of high recreation potential which are also good areas for agriculture, areas of resource extraction, or wilderness areas that should be preserved.

The Little Red Deer River was chosen as the Red Deer Planning Commission's study area for several reasons. The river flows through a diverse range of topography from its headwaters in the foothills to its confluence with the Red Deer. There is much diversity, as well, in vegetation, wildlife and land use along its course. Despite a variety of activities, the Little Red Deer remains relatively undisturbed. This untouched character makes it a good subject for study. Increasing pressure in the area due to recreational demands along with country residential development, highlights the importance of a planning strategy for the river's shorelands.

The major part of the study will be completed and the management plan in final stages by late August of this year.

In addition to the ecological inventory of the shorelands, the study will include an evaluation of land use issues in the Study Area. This phase of the study will likely incorporate a Public Participation Programme in order to allow the public to express opinions and ideas concerning existing and potential land uses along the Little Red Deer River.

Landowners on Little Red Cite Intrusion as Problem

Coping with trespassers has been cited as a major problem by farmers along the Little Red Deer River southwest of here.

The landowners have been airing their views to officials from the Red Deer Regional Planning Commission who are preparing a pilot study of the Little Red.

Trespassing is one of several issues the commission is sorting through in preparation of its final report.

"Farmers are very concerned about the trend of both local and city youths entering agricultural land without permission." says study co-ordinator Rich White.

"An aftermath of garbage, broken bottles, cut fences and damaged crops often occurs."

The planner added, however, "The offenders are not always teenagers, especially where snowmobiles and campers are involved."

Mr. White said the study of the Little Red was initiated in March of this year.

A preliminary report is to be submitted "sometime this fall" to the counties of Red Deer and Mountain View.

The final report is scheduled for completion next March.

Mr. White said in an interview the study of the Little Red is a pilot project by the commission which hopes to apply its findings to other small rivers in this region.

"It's aimed at identifying land use potentials, and land users' preferences," he said.

"Future use patterns would be planned to conform with predetermined standards that have the sanction of the people most affected."

"At the same time," the planner added, "there will be a strong emphasis on guiding future use so that what occurs along the Little Red does not conflict with what is happening elsewhere in Central Alberta."

Mr. White said the commission has wrapped up its physical evaluation of the river and immediate lands.

"We are trying to make the study visible to those affected."

Another issue concerning the region's landowners is ownership of the river shoreland, river bed and water flowing in it.

Mr. White said "property owners want clarification of what they own and what they are taxed on as well as what their rights are as owners of land through which the river flows."

The question of recreation also has arisen.

"A general atmosphere of suspicion exists that the planning commission proposes to designate new or larger areas along the Little Red for camping."

Mr. White said, however, the commission has assured landowners the study "is aimed at determining what future land and water uses would be acceptable along this river."

By Rick Zemanek
Advocate District Editor

ACCESS

TO WHOM IT MAY CONCERN:

Re: LETTER OF INTRODUCTION

The Red Deer Regional Planning Commission is presently engaged in a pilot research study of the Little Red Deer River and its shorelands. Two summer staff members - Garth CLYBURN and Barbara McCORD - are undertaking the field research for this Commission.

The objective of the study is to devise guidelines for the continued use and development of those areas immediately influencing or influenced by the Little Red Deer River. Field work is a necessary part of the evaluation of the resources and land uses along the river. In some areas, the field assistants will have access to the river valley only by traversing private land. We would very much appreciate your co-operation in allowing these people access to the required areas.

Should you have any questions regarding this study, kindly contact either Mr. Rich WHITE or Mr. Bill SHAW at the offices of the Red Deer Regional Planning Commission.

Yours sincerely,

W. G. A. Shaw
Senior Associate Planner

Questionnaire

To: Landowners Along the Little Red Deer River

Re: Land Uses Along the Little Red Deer River

The Red Deer Regional Planning Commission is currently carrying out a study along the Little Red Deer River. In the interest of making the study sensitive to the opinions held by the landowners who reside within the study areas, we are requesting these owners to respond to the enclosed questionnaire. If you will give us your views on these questions, you will be making a valuable contribution to the study. We have kept the questionnaire short so that filling it out will take very little of your time. Please return the completed questionaire as promptly as possible.

We can assure you that your reply will remain completely anonymous. If you have any questions regarding this questionnaire or the study,itself, please feel free to contact Garth Clyburn or Rich White at the Commission office. Your co-operation and information is greatly appreciated.

Yours sincerely,

W. G. A. Shaw
Senior Associate Planner

1) What area(s) of the Little Red Deer River are you most familiar with? Please circle one or more of the following:

a) Confluence of the Little Red and the Big Red to Red Lodge Provincial Park.
b) Red Lodge Provincial Park to the bridge near Eagle Hill.
c) Eagle Hill bridge to Westward Ho.
d) Westward Ho to Elkton.
e) Elkton to the bridge west of Cremona.
f) Cremona bridge to the bridge north west of Water Valley.
g) Upstream of the Water Valley bridge.

2) Do you or your family make use of the Little Red and its shoreland for recreation?

Yes ______ No ______

If so, please specify what type of recreation.

3) a) Approximately how many other people use your property along the river for recreational purposes?

b) Can you make any generalizations about where these people come from and what type of recreational activities they are engaged in?

4) a) What uses would you like to see within 1/2 mile of the river? Please indicate by numbers what your first four preferences are for each of the columns (ie - 1 for the most desirable, 2 for the second most desirable use, etc.)

Immediate vicinity of your property	Along the entire river	
______	______	a) agriculture
______	______	b) oil and gas recovery
______	______	c) sand and gravel excavation
______	______	d) timber harvesting
______	______	e) country residential
______	______	f) cottaging
______	______	g) non-motorized recreation - cross country skiing, fishing, hiking, etc.
______	______	h) motorized recreation - snowmobiling, trail-biking, etc.

b) What land uses don't you want to see along the Little Red? Please rank your first four choices for each of the columns.

Immediate vicinity of your property	Along the entire river	
______	______	a) agriculture
______	______	b) oil and gas recovery
______	______	c) sand and gravel excavation
______	______	d) timber harvesting
______	______	e) country residential
______	______	f) cottaging
______	______	g) non-motorized recreation
______	______	h) motorized recreation

What are the reasons for your choices?

5) a) Are you aware of any land use conflicts within your immediate area?

Yes ______ No ______

If so, please specify:

b) Are there any conflicts occurring that are common to the entire length of the river?

Yes ______ No ______

If so, please specify:

6) What do you think can be done to solve any of the conflicts you may have mentioned in the previous question?

7) a) Do you feel that more campgrounds should be established along the Little Red?

Yes ______ No ______ If so, along what part of the river should these facilities be developed?

Should these campgrounds be privately or publicly owned?

b) Do you feel that any of the existing campgrounds along the Little Red should be closed down?

Yes ______ No ______ If so, please specify which campgrounds and why:

8) Would you like to become involved in the development of planning policies for the Little Red?

Yes ______ No ______ If so, how would you like to contribute:

a) Presentation of personal or group briefs to the Planning Commission.
b) Attend public meetings.
c) Others, please specify.

We appreciate the time you have taken to answer this questionnaire. Please use the back side of this sheet for any additional comments you may have concerning the Little Red or this study.

PUBLIC MEETINGS

Landowners along the valley of the Little Red Deer River met with staff from the Red Deer Regional Planning Commission recently. Meetings were called at the Oklahoma Community Hall and the Water Valley Community Hall by the respective Community Associations and both were well attended. Discussion covered a broad range of topics surfaced by the local people.

The most urgent topic discussed at both meetings was the trespass problem. Farmers are very concerned about the trend of both local and city youth to enter agricultural land without permission and to do as they please there. An aftermath of garbage, broken bottles, cut fences, and damaged crops often occurs. Unfortunately the offenders are not always just teenagers, especially where snow mobiles and campers are involved. Planning Commission staff expressed concern about this issue but indicated that the current study would not be able to do much more than publicize the problem. The Study of the Little Red Deer River Valley is aimed at identifying land use potentials, and land users' preferences. Future use patterns would be planned to conform with predetermined standards that have the sanction of the people who are most affected. At the same time, there will be a strong emphasis on guiding future use so that what occurs along the Little Red Deer River does not conflict with what is happening elsewhere in Central Alberta. Recommended land use standards will likely take the form of zoning which designates acceptable locations for various uses and general constraints on the intensity of use, but zoning will not prevent violations of property rights.

Two other issues dominated the discussions at the meetings. First of all there is the question of ownership of the river shoreland, the bed of the river and the water flowing in it. Property owners want clarification of what they own and what they are taxed on as well as what their rights are as owners of land through which the river flows. There is a lot of legislation that deals with these concerns, but, in part the issue may be resolved by stating that the Crown owns all river beds and the water in the rivers and therefore property owners should not be taxed for acreage underlying the stream itself.

The third issue is related to camping and campgrounds. A general atmosphere for suspicion exists that the Planning Commission is planning to designate new or larger areas along the Little Red Deer for camping. Those in attendance were given much assurance by the Commission staff that this was not the case. Rather the Study is aimed at determining what future land and water uses would be acceptable along this river. Campgrounds are only one of the possibilities being considered. A questionnaire that was mailed out earlier and the public meetings are means being used to learn what uses the local residents consider to be acceptable and which are not acceptable.

Further public meetings are expected in other[33] communities and continued communication with all groups and individuals will go on until this Study has been completed. Rich White, the study leader is encouraging interested people to bring their concerns and interests to his attention by phoning 343-3394 or writing Box 5002, Red Deer.

EXERPTS FROM A BRIEF PRESENTED BY THE WATER VALLEY WORKING GROUP

A public meeting was held at Water Valley, Alberta on August 24, 1976. Representatives of the Red Deer Planning Commission emphasized the need for resident and landowner opinion and input in order that any official plans which might be proposed should satisfy the wishes of those individuals most intimately involved.

A working group of valley property owners was formed to determine, if possible, the most satisfactory uses to which the river valley may be subjected. The principal concern of both landowners who control the properties adjacent to the river, and the various governmental ag-agencies who are entrusted by the public to administer and protect these waters should be to establish a program of uses and development in which both the private and public interests may be best served.

Results of Study

The results of this preliminary study revealed the uses and developments which are believed not only practical, but imperative if a satisfactory compromise between private and public interests is to be attained.

1. Where viable agricultural activities are being undertaken, these uses should not be discouraged. The responsible farmer or rancher who owns land adjacent to the river, must be allowed, to continue his agricultural endeavours.

2. It is imperative that much larger and more securely controlled parks and recreational facilities be established to accommodate visitors. The need for larger recreational areas to handle the present influx is apparent in the extreme crowding and uncontrolled activities of existing facilities.
3. Where present parks and facilities comprise a few acres throughout the county, areas totalling a few hundred acres will be required to serve this population if private landowners are to be spared continued harassment, pollution and vandalism. These larger recreational facilities should be established preferably in the forested upper reaches of the river and its tributaries, in areas far-removed from agricultural activities, where their influence on farmers and ranchers can be minimized. Adequate security, policing, and control of such large parks and facilities must be maintained for the benefit, not only of those who will use these areas, but also of the adjacent landowners.
4. The use of snow machines, all-terrain vehicles and other mechanized recreational units, if permitted, must be confined to specified and clearly marked areas in order to avoid conflict with adjacent landowners and other users of the wilderness facilities.
5. Certain portions of the study area are suitable for residential subdivision. Such subdivisions, whether for summer residences or permanent dwellings, should be sufficiently small (less than 5 acre parcels) to prohibit agricultural usage, and they should bear their proportionate share of any burden to which the county may be subject as a result of their presence.

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[33] Meetings were also held at Elkton and at Eagle Hill, with good attendance and participation.

6. Pressure is, at present, being exerted on the County to accomodate more permanent residents whose livelihoods are derived within the county from sources other than agriculture, and who are unable under existing statutes and bylaws to obtain satisfactory permanent status. Taxation of such parcels and residences should be based primarily on a residential rather than on an agricultural assessment.

7. An accurate and meaningful definition of the public domain on either side of a river or other water course must be established and publicized.

8. Trespass laws and landowner vulnerability to legal action are matters of some concern. A clear understanding of landowner liability should be determined and publicized through local media for the benefit of both property owner and potential trespasser.

9. Timber harvesting by individual landowners, on a selective basis, should be permitted, providing that the river and its tributaries are not overly disturbed.

10. Oil and gas development and other industrial activities are of only minor concern to landowners within the study area.

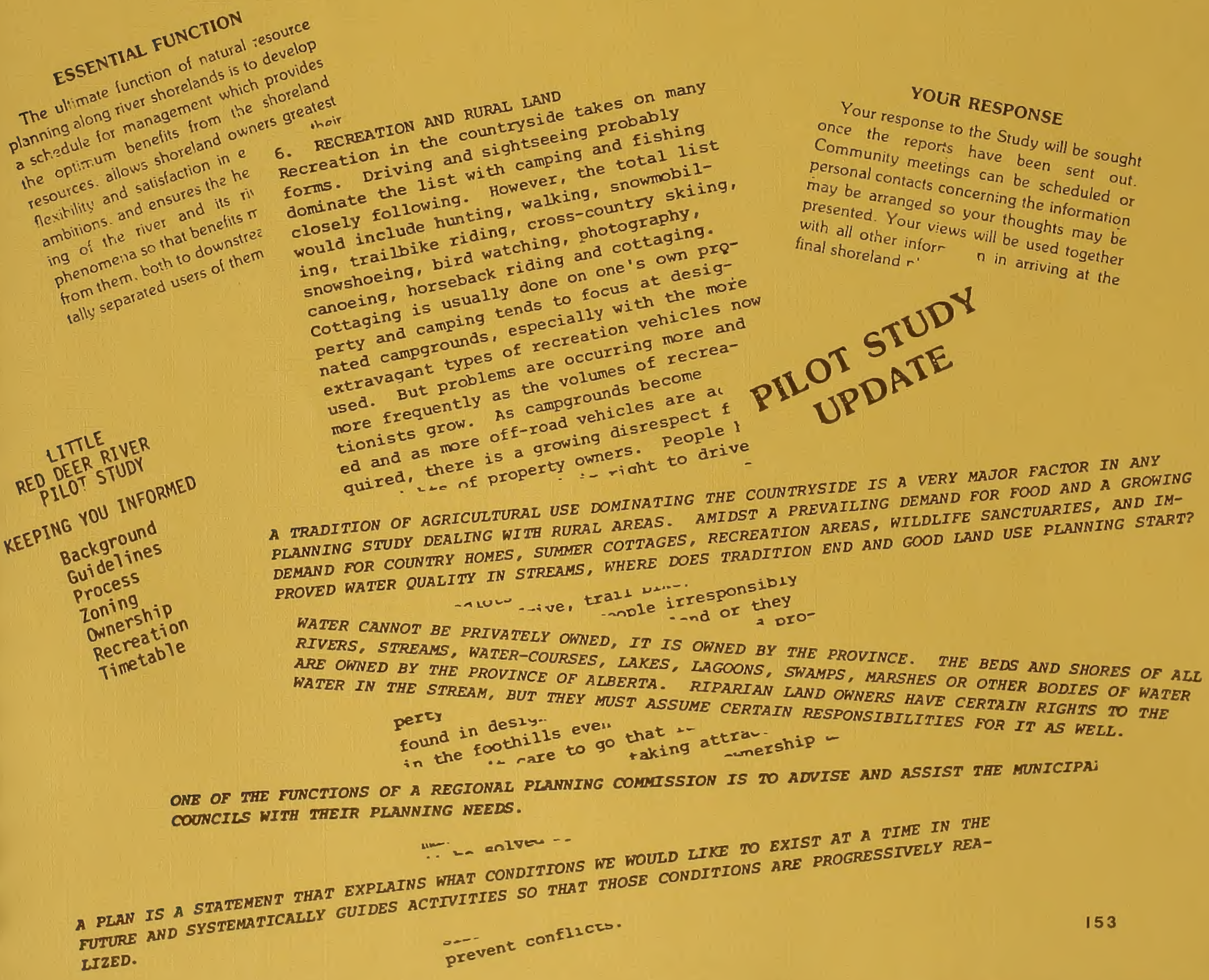
11. Landowners wish to avoid directing hunters to areas of abundant wildlife.

12. As secondary highways are upgraded and paved throughout the southwestern part of the province, some of the congestion in the Water Valley area should be alleviated. However, proximity to urban centres will continue to place pressure on this local area; for this reason, programs must be initiated today to prevent excessive disruptions tomorrow.

Working Group Members

A. Beveridge, Chairman
J. Bates
J. Lane
P. Newsome
H. Roessingh
W. Ross

NEWSLETTERS



ESSENTIAL FUNCTION

The ultimate function of natural resource
planning along river shorelands is to develop
a schedule for management which provides
the optimum benefits from the shoreland
resources. allows shoreland owners greatest
flexibility and satisfaction in e
ambitions. and ensures the he
ing of the river and its ri
phenomena so that benefits m
from them. both to downstrea
tally separated users of them

their

6. RECREATION AND RURAL LAND

Recreation in the countryside takes on many
forms. Driving and sightseeing probably
dominate the list with camping and fishing
closely following. However, the total list
would include hunting, walking, snowmobil-
ing, trailbike riding, cross-country skiing,
snowshoeing, bird watching, photography,
canoeing, horseback riding and cottaging.
Cottaging is usually done on one's own pro-
perty and camping tends to focus at desig-
nated campgrounds, especially with the more
extravagant types of recreation vehicles now
used. But problems are occurring more and
more frequently as the volumes of recrea-
tionists grow. As campgrounds become
ed and as more off-road vehicles are ac
quired, there is a growing disrespect f
of property owners. People
right to drive

YOUR RESPONSE

Your response to the Study will be sought
once the reports have been sent out.
Community meetings can be scheduled or
personal contacts concerning the information
may be arranged so your thoughts may be
presented. Your views will be used together
with all other inforr n in arriving at the
final shoreland r

PILOT STUDY UPDATE

LITTLE
RED DEER RIVER
PILOT STUDY

KEEPING YOU INFORMED

Background
Guidelines
Process
Zoning
Ownership
Recreation
Timetable

A TRADITION OF AGRICULTURAL USE DOMINATING THE COUNTRYSIDE IS A VERY MAJOR FACTOR IN ANY PLANNING STUDY DEALING WITH RURAL AREAS. AMIDST A PREVAILING DEMAND FOR FOOD AND A GROWING DEMAND FOR COUNTRY HOMES, SUMMER COTTAGES, RECREATION AREAS, WILDLIFE SANCTUARIES, AND IMPROVED WATER QUALITY IN STREAMS, WHERE DOES TRADITION END AND GOOD LAND USE PLANNING START?

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WATER CANNOT BE PRIVATELY OWNED, IT IS OWNED BY THE PROVINCE. THE BEDS AND SHORES OF ALL RIVERS, STREAMS, WATER-COURSES, LAKES, LAGOONS, SWAMPS, MARSHES OR OTHER BODIES OF WATER ARE OWNED BY THE PROVINCE OF ALBERTA. RIPARIAN LAND OWNERS HAVE CERTAIN RIGHTS TO THE WATER IN THE STREAM, BUT THEY MUST ASSUME CERTAIN RESPONSIBILITIES FOR IT AS WELL.

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found in desig
in the foothills even
care to go that
taking attrac
ownership

ONE OF THE FUNCTIONS OF A REGIONAL PLANNING COMMISSION IS TO ADVISE AND ASSIST THE MUNICIPAL COUNCILS WITH THEIR PLANNING NEEDS.

solved

A PLAN IS A STATEMENT THAT EXPLAINS WHAT CONDITIONS WE WOULD LIKE TO EXIST AT A TIME IN THE FUTURE AND SYSTEMATICALLY GUIDES ACTIVITIES SO THAT THOSE CONDITIONS ARE PROGRESSIVELY REALIZED.

prevent conflicts.

N.L.C. - B.N.C.
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